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THE VACCINATION QUESTION IN THE LIGHT OF MODERN EXPERIENCE

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THE
VACCINATION QUESTION IN THE LIGHT OF MODERN EXPERIENCE

AN APPEAL FOR RECONSIDERATION

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Dedicated

TO THE MEMORY OF

EDWIN CHADWICK,

A GREAT SANITARY REFORMER,

WHOSE IDEALS, SO FAR AS THEY HAVE BEEN

CARRIED OUT,

HAVE LARGELY CONTRIBUTED TOWARDS ABOLISHING

SMALLPOX FROM THESE ISLANDS.

PREFACE

It is now eighteen years since the Royal Commission on Vaccination issued its Final Report. Since then, little or no attempt has been made seriously to review the Vaccination Question in the light of the experience gained in recent years. Yet, without doubt, much has been learned and some things have been unlearned. Moreover, almost every writer, hitherto, has approached this question from the point of view of either the pro-vaccinist or the anti-vaccinist. The present writer has endeavoured to take up an entirely independent standpoint. He has not been concerned either to defend or to attack vaccination, and he has, therefore, felt quite at liberty to use any argument that appeared to him, after mature consideration, to be sound, irrespective of whether it told in favour of or against vaccination. At the same time he believes that the case he is presenting will be found logical and consistent and neither lacking in colour nor devoid of definite conclusions.

The Royal Commissioners issued their Report in 1896. In place of reaffirming the principle of uncompromising compulsion—as many expected and hoped—the Report went a long way towards the abolition of compulsion by recommending the recognition of the "conscientious objector." At that time, the country had had comparatively little experience of those modern measures for dealing with smallpox—notification, isolation, supervision of contacts, etc.—which have since proved so effective, and the "Leicester Experiment" had been on its trial for only about twelve years. The Commissioners naturally felt considerable doubt as to how far these modern measures could be trusted to control smallpox in the absence of infantile vaccination. Nevertheless, a transference of only three votes (in a Commission of thirteen) would have given a majority, even at that time, in favour of the entire abolition of compulsory vaccination.

If the Commissioners could have had laid before them the experience which is now available; if they could have foreseen how efficacious these modern measures would prove in stamping out smallpox outbreaks; if they could have been assured that the prophecies of disaster where vaccination was neglected would have been unfulfilled; if the "Leicester Experiment" had been tried successfully for thirty years (as is now the case) instead of only twelve, it is highly probable—to say the least of it—that their verdict would have been against compulsion in any form.

For forty years, corresponding roughly with the advent of the "sanitary era," smallpox has gradually but steadily been leaving this country. For the past ten years the disease has ceased to have any appreciable effect upon our mortality statistics. For most of that period it has been entirely absent except for a few isolated outbreaks here and there. It is reasonable to believe that with the perfecting and more general adoption of modern methods of control and with improved sanitation (using the term in its widest sense) smallpox will be as completely banished from this country as has been the case with plague, cholera, or typhus fever.

Accompanying this decline in smallpox there has been a notable diminution during the past decade in the amount of infantile vaccination. This falling off in vaccination is steadily increasing and is becoming very widespread.

Meanwhile the agitation against vaccination continues, and it is likely to continue so long as the compulsory clauses of the Vaccination Acts remain unrepealed. To the anti-vaccinist vaccination is not merely useless and objectionable, it is positively hateful, and he regards the compulsory clauses of the Vaccination Acts as a blot on the Statute Book. This attitude towards vaccination may be unreasonable, but it has to be reckoned with. After all it is hardly surprising that the anti-vaccinist is not satisfied with the "privilege" of being allowed to beg for "exemption" as a favour. Vaccination was originally made compulsory on the express grounds that such compulsion was necessary for the safety of the community and on the assumption that unvaccinated persons were a danger to their neighbours. It is becoming very doubtful, in the light of modern experience, whether this necessity any longer exists ; whilst it would appear that it is vaccinated persons whose vaccination has "worn out," rather than the un-vaccinated, who are the real danger to their neighbours.

The writer draws a broad distinction between the *individual* and the *community* as regards the effect of vaccination. So far as the effect upon the individual is concerned he differs little if at all from the orthodox pro-vaccinist position. He accepts the protective influence of vaccination upon the individual as absolutely proven, and starts with this proposition as axiomatic. On the other hand, he believes that there is still much room for further consideration as regards the effect upon the community.

Unfortunately, free and independent discussion on the question of vaccination has not, hitherto, received much encouragement. Indeed, it is no exaggeration to say that there has even been a tendency to stifle discussion. The writer can speak from personal experience. Two recent instances only need be quoted:

(1) A leading morning paper published some extreme pro-vaccinist statements prophesying that " red terror " would overtake this country if the neglect of infantile vaccination were persisted in. The writer sent a moderately-worded letter taking exception to these statements. The letter was returned with a polite note from the editor regretting that he could not find space for it and the controversy which it might evoke.

(2) The writer received a letter from the Honorary Secretary of the Section of State Medicine of a Health Congress requesting him, in the name of the President of the Section, to contribute a paper. A subject was suggested in which he thought the writer was interested, but, it was added, " the President will be glad to accept another subject if you prefer it." The writer replied that he would be pleased to contribute a paper, but as he was specially interested in the question of vaccination he proposed to take that as his subject. He mentioned that his views were not quite orthodox, and that the paper might therefore lead to a good discussion. He received a reply thanking him for his letter, which had been laid before the President, but saying: " Dr. —— asks me to say that he thinks it better to decline your offer. He feels that Anti-Vaccinators, with

whose views you have nothing in common, might wilfully or unconsciously distort your statements. . . ."

This book embodies the substance, in amplified form, of a course of lectures given in London early in the present year under the auspices of the Chadwick Trust. It is published in the hope that it may arouse fresh interest in a highly complex question, the last word on which has certainly not yet been said.

The writer owes an apology to his readers for the frequent use of the personal pronoun. The controversial nature of the subject, however, and the independent position taken up, have rendered it difficult to avoid this.

Cordial thanks are due to all those who have assisted the writer with information, including a large number of Medical Officers of Health and the Registrars-General of England, Scotland, and Ireland. He desires specially to mention Dr. Arthur Drury, Honorary Secretary of the Association of Public Vaccinators, and Miss L. Loat, Secretary of the National Anti-Vaccination League. He is indebted to his colleague, Dr. Allan Warner, School Medical Officer for Leicester, and formerly Resident Medical Officer at the Leicester Smallpox Hospital, for two of the photographs of smallpox cases.

He is indebted to his wife for much help and assistance in the preparation of the book, including her careful revision of the proof sheets.

C. K. M.

LEICESTER, 1914.

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CONTENTS

CHAPTER I

THE VACCINATION CONTROVERSY AT THE PRESENT DAY

The Vaccination Controversy Unique—Pro-vaccinists and Anti-vaccinists—Extreme Attitude of the Two Sides—Bitterness of the Controversy—Where the Truth Lies—The Writer's Credentials—Outline of the Writer's Position—Visit of Writer's Family to Leicester Smallpox Hospital . . . . pp. 1–8

CHAPTER II

THE VACCINATION QUESTION IN DETAIL

Distinction between Individual and Community—Vaccination a Protection to Individual—An Error of Tactics—The Real Question at Issue—Effect on Community—Smallpox Leaving Great Britain Independently of Vaccination—Mortality during Past 150 Years—Modern Methods of Dealing with Smallpox—Isolation, Notification, Surveillance of Contacts, etc.—Relative Risks of Vaccination and Smallpox—Vaccination not Ideal—Risk of Infants Contracting Smallpox Over-estimated—Infantile Vaccination alone Quite Insufficient to Protect Community—Tendency of Vaccination to Spread Smallpox—Re-vaccination . . . . . . pp. 9–26

CHAPTER III

THE ROYAL COMMISSION ON VACCINATION

A Remarkable Inquiry—The Terms of Reference—Findings of the Commission—Majority Report—Effect of Vaccination in Preventing Smallpox—Conclusions of Commissioners as to Protective Effect—Means other than Vaccination for Preventing Smallpox—Value of Hospital Isolation—Opinion of Buchanan and Thorn—Experience of London—Means for Preventing ill-effects of Vaccination—Question of Compulsion—Minority Report . . . . pp 27–43

CHAPTER IV

THE RELATIVE IMPORTANCE OF VACCINATION AND SANITATION

Meaning of the Word "Sanitation": Includes Isolation, and Other Modern Measures—Definition of "Sanitation" given in Minority Report—Edwin Chadwick and Sanitation—The Experience of India—Experience of Japan—Experience of Great Britain—Examples of Good Vaccination but Bad Sanitation: (1) Middlesbrough; (2) Warrington; (3) Sheffield—Why not Vaccination *plus* Sanitation? pp. 44–62

CHAPTER V

THE TENDENCY OF VACCINATION TO SPREAD SMALLPOX BY MASKING THE DISEASE

This Aspect of the Question Hitherto Overlooked—In Mitigating Smallpox Vaccination also Masks the Disease—Apparent "Mildness" of Smallpox Modified by Vaccination (being an Acquired Character) is not Transmitted—Authoritative Opinions as to the Rôle of the Unrecognised Case: J. Niven: A. K. Chalmers: G. F. McCleary: W. E. Armstrong: Ernest Hart—Frank Admissions—P. Boobbyer—J. H. C. Dalton—Unrecognised Cases in the Unvaccinated—Experience of Individual Towns—Leicester . . pp. 63–77

CHAPTER VI

THE TENDENCY OF VACCINATION TO SPREAD SMALLPOX (*Continued*)

The Experience of Other Towns—London: Fatal Outbreak at Mile End Infirmary Caused by Vaccinated Child—Kirkcaldy: Fatal Outbreak Caused by Vaccinated Child—Ossett: School Outbreak of Very Mild Type Caused by Unvaccinated Child—Newhaven: Fatal Outbreak Caused by Sailor (presumably Vaccinated)—Halifax: Disastrous Effect of Unrecognised Cases in Vaccinated Persons—Coventry—Cardiff . . . . pp. 78–100

CHAPTER VII

THE LEICESTER EXPERIMENT

(*a*) THE MOVEMENT AGAINST VACCINATION

McVail on "Leicester's Gigantic Experiment"—Misapprehensions as to the Experience of Leicester—Prof. Berry's "Incontrovertible" Facts—History of the Movement Against Vaccination—Prosecuting Campaign—Great Anti-vaccination Demonstration—Emphatic Warnings—Leicester and the R.C.V.—Leicester Guardians and the L.G.B.—Writ of Mandamus . . . . pp. 101–118

CHAPTER VIII

THE LEICESTER EXPERIMENT (*Continued*)

(*b*) RESULTS

History of Smallpox in Leicester—The Great Epidemic of 1871-2—Why the Disease Spread—Dawn of Sanitation in Leicester—Ald. Windley Appointed Chairman of Sanitary Committee—Effect of Sanitation upon Smallpox—Statistics of Smallpox Epidemics in Leicester—The "Leicester Method" of Dealing with Smallpox: Surveillance of Contacts: Quarantine: Searching for Contacts—Vaccination and Compensation of Contacts—Chief Inspector Braley—The Epidemic of 1892-3—Effect of Unrecognised Cases—Outbreak in the Fever Hospital—The Epidemic of 1902-3—The April "Flare"—How the Situation was Saved—The Epidemic of 1903-4—Fatality of Smallpox in Leicester Compared with Other Towns . pp. 119-141

CHAPTER IX

THE LEICESTER EXPERIMENT (*continued*)

(*c*) SOME OBSERVATIONS ON THE EXPERIENCE OF LEICESTER

Prophecies Unfulfilled: A Complete Justification of Policy Pursued—Experience of Leicester Quite Conclusive as to Value of Vaccination in Protecting Individual—The Smallpox Hospital Staff—Effect of Vaccination after Exposure to Infection—Vaccinal Condition of Invaded Houses—Low Case Mortality of Smallpox in Leicester—Small Part Played by the Children and Schools—Comparative Immunity of Infants—Influence of General Vaccination—Cost of Dealing with Smallpox in Leicester . . . . . . pp. 142-151

CHAPTER X

DEWSBURY AND GLOUCESTER: AN INSTRUCTIVE CHAPTER IN THE HISTORY OF SMALLPOX PREVENTION

I. THE CASE OF DEWSBURY

How not to Deal with Smallpox—Dr. Wheaton's Report on Condition of Dewsbury Hospital—Ravensthorpe: the Breakdown of Hospital Isolation—Spread of Infection from Hospital, and by Unrecognised Cases—Dr. Spencer Low's Report—The Failure of the L.G.B.

II. THE CASE OF GLOUCESTER

Dr. Coupland's Opinion—Gloucester's Tragic Experience—History of the Epidemic—Heavy Mortality amongst the Unvaccinated—Origin of Epidemic in Vaccinated Cases—School Outbreaks—Rapid Extension—Breakdown of Hospital Isolation—Comparison with Leicester—Origin of School Outbreaks—What the Government Might have Done . . . . pp. 152-166

CHAPTER XI

INJURIES CAUSED BY VACCINATION

Difficulty of Appreciating Vaccinal Injuries at True Value—Anti-vaccinists Exaggerate, Pro-vaccinists Under-estimate Them—Pecuniary Interest of Medical Profession—The Misterton Outbreak of Vaccinal Erysipelas—Other Outbreaks—The R.C.V. and Injuries Caused by Vaccination—The Minority Report—Dr. T. D. Acland on Vaccinal Injuries: Eczema; Impetigo; Erysipelas; Ulceration and Abscess; Gangrene; Septic Infection; Vaccinal Syphilis—Concluding Remarks pp. 167–184

CHAPTER XII

CONCLUSION

The Future Outlook—Emergency Vaccination—Practicability of Vaccinating an Entire Community as a *dernier ressort*—How to Improve the Alternative Means of Defence—The Danger of Unrecognised Cases—Lack of Medical Skill in Diagnosis—The Remedy—Germany and Great Britain—Vaccination still necessary in Special Cases—Conclusion . . . . pp. 185–192

APPENDICES

I. Some Characteristics of Smallpox which Distinguish it from other Zymotic Diseases . p. 195

II. Comparison between Vaccination and Smallpox Inoculation . . . . p. 197

III. Synopsis of Principal Events in the History of Vaccination as a State Institution . p. 199

IV. Warnings by Medical Officers of Health as to Danger of Neglecting Infantile Vaccination . . . . p. 201

V. Statistical Proof of the Effect of Vaccination in Modifying Smallpox . . . . p. 206

(1) Bristol. (2) Bradford. (3) Manchester.

VI. (1) PARTICULARS OF OUTBREAKS OF SMALLPOX OCCURRING IN LEICESTER IN 1902 . . p. 209

(2) STATISTICS OF SMALLPOX IN LEICESTER, 1903–1904 . . . . p. 213

VII. FURTHER ILLUSTRATIONS OF THE DANGER OF UNRECOGNISED CASES OF SMALLPOX MODIFIED BY VACCINATION . . . . . . p. 223

(1) Bristol.
(2) Manchester.
(3) Salford.
(4) Newcastle-on-Tyne.
(5) Nottingham.
(6) Oldham.
(7) Bootle.
(8) Leeds.
(9) Glasgow.
(10) South Shields.
(11) Cambridge.

LIST OF ILLUSTRATIONS

PLATES

PAGE

I. Recently Vaccinated Persons need not fear Smallpox 8

I(*a*). Hands and Forearms of Patients seen in Previous Plate 8

II. Unmodified Smallpox 64

III. Smallpox Modified by Vaccination . . . 64

IV. Smallpox in an Unvaccinated Child . . . 64

V. Smallpox in a Vaccinated Child 64

VI. Which is the Greater Danger to the Community 64

VII. The Value of Vaccination in Protecting Smallpox Nurses 144

VIII. Fatal Smallpox in a Nurse 144

IX. The Foolish Father and the Wise Child . . 147

DIAGRAMS

I. Mortality from Smallpox and Other Zymotic Diseases in London, 1760–1910 14

II. Smallpox, Scarlet Fever, Enteric, and Vaccination, England and Wales 16

III. Smallpox, Scarlet Fever, and Vaccination, Scotland 17

IV. Smallpox, Scarlet Fever, and Vaccination, Ireland 18

PAGE

V. SMALLPOX IN LEICESTER, 1893, EFFECT OF UNRECOGNISED CASES 73

VI. SMALLPOX IN LEICESTER, 1903, EFFECT OF UNRECOGNISED CASES 76

VII. SMALLPOX IN NEWHAVEN, 1913, EFFECT OF UNRECOGNISED CASES 89

VIII. SMALLPOX IN HALIFAX, 1903, EFFECT OF UNRECOGNISED CASES 93

IX. SMALLPOX IN COVENTRY, 1903, EFFECT OF UNRECOGNISED CASES 96

X. SMALLPOX IN CARDIFF, 1903, EFFECT OF UNRECOGNISED CASES 98

XI. LEICESTER, MORTALITY FROM "FEVERS," SMALLPOX AND SCARLET FEVER, 1838–1912 120

THE VACCINATION QUESTION
IN THE
LIGHT OF MODERN EXPERIENCE

CHAPTER I

THE VACCINATION CONTROVERSY AT THE PRESENT DAY

The Vaccination Controversy Unique—Pro-vaccinists and Anti-vaccinists—Extreme Attitude of the Two Sides—Bitterness of the Controversy Where the Truth Lies—The Writer's Credentials—Outline of the Writer's Position—Visit of Writer's Family to Leicester Smallpox Hospital.

THE Vaccination Question undoubtedly constitutes one of the most remarkable controversies of the age. In many ways it is unique. Beginning in the early days of last century when vaccination was first introduced, it only became a popular question when vaccination was made compulsory in 1853. It attained its most acute phase after the Vaccination Act of 1872, which, passed with the object of securing the more efficient enforcement of the Vaccination Laws by the appointment of Vaccination Officers, may be regarded as representing the high-water mark of compulsion. Since the Vaccination Act of 1898 with the noteworthy Conscience Clause, and still more since the Act of 1907 permitting the father to make a statutory declaration before a Justice of the Peace in place of having to go into Court, real compulsion has been very largely abolished, and popular feeling in connection with vaccination has naturally cooled down considerably; but, at the same time, the opposition to vaccination is still strong and widespread, whilst the number of those who do not have their children vaccinated is steadily increasing. The frequency with which the question of vaccination crops up in Parliament, and the persistency with which the President of the L.G.B. is bombarded with interrogations at every opportunity and on any kind of pretext, is evidence of the strength and popular character of the feeling against vaccination. Without doubt the agitation against vaccination is the outcome of the compulsory law and would die a natural death if the compulsory clauses were repealed. At the present time active controversy is chiefly kept up, on the one side by certain medical men specially interested in the subject and who are backed up by the great majority of the medical profession—these we shall refer to as the Pro-vaccinists—and on the other side by certain very active individuals of independent views and opinions, whom we shall refer to as the Anti-vaccinists, who have comparatively little, if any, respect for authority as such, and who frequently differ from orthodox teaching on other subjects besides vaccination.[1] These Anti-vaccinists undoubtedly have a large number of sympathisers, chiefly, though by no means exclusively, amongst the democracy.

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[1] The Official Society of the Anti-vaccinists is the National Anti-vaccination League, and their office is at 27, Southampton Street, Strand. The Secretary is Miss L. Loat. The official organ of the society is *The Vaccination Inquirer*, published monthly. The Society employs a lecturer and organiser (Mr. J. H. Bonner).

At the present time the principal pro-vaccinist organisation is the Association of Public Vaccinators of England and Wales, of which Dr. Arthur Drury is the energetic Hon. Secretary and moving spirit. The official organ of the Association is *The Jennerian*, a monthly supplement to *The Medical Officer*, Dr. Drury being the Editor. For many years the Jenner Society, founded by the late Dr. F. T. Bond, of Gloucester, was the principal pro-vaccinist society, and it carried on at one time an active propaganda by means of lectures, popular literature, and newspaper correspondence. The remains of this organisation have now been taken over by Dr. Drury.

Towards the end of his life Dr. Bond considerably modified some of his views, and became much less *pro-vaccinist* than when he first started the Jenner Society. The writer frequently corresponded with him and has reason for thinking that he had ceased to believe in the great importance or necessity for compulsory vaccination. Dr. Bond publicly advocated the extension of the age limit for primary vaccination to six years, on the ground that the vaccination of infants was not very necessary and open to some objection. At the same time he advocated compulsory re-vaccination.

About fifteen years ago another organisation—The Imperial Vaccination League—came into existence and carried on an active campaign for a short period. The Hon. Secretary and moving spirit was Mrs. Garrett Anderson, M.D. This society appears now to have ceased to exist.

A regrettable feature of the controversy is the great bitterness which exists in connection with it, but this is hardly surprising in view of the penal clauses of the Vaccination Acts, which, prior to the passing of the Conscience Clause, were often enforced with much severity, not to say tyranny.

There is also the fact that some of the most bitter Anti-vaccinists believe, possibly with good reason, that they themselves, or members of their families, have suffered serious injury to their health through vaccination. The thorough-going Anti-vaccinist is not merely opposed to vaccination, but hates it as the accursed thing.[1] To resist the Vaccination Laws is with him a matter of duty, almost of religion. The Pro-vaccinist, on the other hand, convinced of the strength of the case for vaccination, has an outspoken contempt for the "ignorance" and "misguided folly" of the Anti-vaccinist, and many of the medical journals can scarcely speak of the Anti-vaccinists with patience or civility. This attitude of the Pro-vaccinist Press is certainly to be regretted, especially as there is serious reason to believe that the Anti-vaccinist is not wholly in error.

Disparaging epithets are freely used by either side, though it must be admitted that the Anti-vaccinists easily have pride of place for the richest and most varied vocabulary! Whilst the Pro-vaccinists like to refer to their opponents as "cranks," and "ignorant faddists," guilty of "criminal folly," etc., the Anti-vaccinists do not hesitate to describe the Pro-vaccinists as "medical impostors" and "blood-sucking tyrants." Whilst Pro-vaccinists rejoice in referring to vaccination as "one of the most beneficent agents for the health of the human race that has ever been given to man," the Anti-vaccinists ring the changes on such appellations as "filthy rite," "relic of barbarism," "grotesque superstition," "monstrous imposition," and "legalised assassination"! I think it was a well-known stalwart from Birmingham, a past-master in the use of this picturesque language, who recently referred to public vaccinators as " myrmidons of the rabid cult of official blood-poisoners " ! Whilst Jenner likened the typical vaccine vesicle to " a pearl upon a rose-petal," the Anti-vaccinist speaks of " corruption " and refers to vaccine lymph as " putrescent slime."

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[1] *The Vaccination Inquirer*, March 1914, wrote: "Many of us would prefer an attack of smallpox to vaccination, all of us would prefer the risk of smallpox to the certainty of vaccination. Smallpox is a natural disease running a known course. . . . Vaccination is a loathsome disease of uncertain origin, artificially transmitted through various beasts and capable of setting up a variety of repulsive, dangerous, and even fatal affections."

It may be added that the two sides in this controversy entirely distrust each other and refuse to accept as reliable the facts put forward by the other side when not convenient to refute them by argument. Indeed, each side regards the other as thoroughly unscrupulous and untrustworthy in its controversial methods. It is scarcely necessary to say that each side is quite convinced of the strength of its own case and of the unanswerableness of its arguments, and fails to comprehend how there can reasonably be two opinions about a question at once so simple and so capable of easy demonstration—or refutation—as that of vaccination. The Anti-vaccinists firmly believe that the entire medical profession, with a few honourable exceptions—who happen to be Anti-vaccinists, have entered into a conspiracy to deceive the public with the object of making money out of vaccination. The Pro-vaccinists, on the other hand, regard the Anti-vaccinists as noisy and misguided fanatics, unworthy of the serious consideration of intelligent men.

The moderate man may well exclaim, " A plague o' both your houses ! " As regards public debate and newspaper controversy, it may be mentioned that the expert Anti-vaccinist, who has often made a life-study of the subject and has all the facts at his fingers' ends as well as being an expert and skilful dialectician, is frequently more than a match for the average medical defender of vaccination, who is apt to rely too much on the stock arguments in favour of vaccination which he read in text-books as a medical student many years before. Latterly, indeed, there has been an increasing and judicious tendency on the part of medical men to avoid the public platform, and to leave open debate to those members of the profession who have made a special study of the subject.

Lastly, it is needless to say that both sides have suffered severely from the indiscretions of their friends. It would be easy to give numerous instances of the loose and inaccurate statements which enthusiasts on either side have made, and, indeed, still frequently make whenever this subject is discussed.

Where the Truth Lies

I do not think the above sketch has been coloured too strongly. It is certainly the case that between the Pro-vaccinist and the Anti-vaccinist a great gulf is fixed, and hitherto no serious attempt has been made to bridge this over or to find out whether there be any common ground on which to reconcile the opposing parties. Consequently there has been no intermediate position open to the moderate man. He has had either to believe in vaccination or to disbelieve in it, and there was an end of it!

Now one object of this book is to show that the question of vaccination is not nearly so simple as its supporters and opponents appear to think—that there is still room for legitimate discussion and inquiry, and to suggest that perhaps, after all, the whole truth does not lie in either one camp or the other, but will be found, rather, in an intermediate position lying somewhere between them.

The Writer's Credentials

Before essaying this task, however, I should like to say that the views I am about to put forward have not been lightly or hastily arrived at, or without a due sense of responsibility. They have been gradually forced upon me during a considerable period. For the past thirteen years I have held the position of Medical Officer of Health for the Borough of Leicester, a town which has played a unique part in connection with the vaccination question and which is recognised as being the most unvaccinated town in the country. Since I have been in Leicester, I have had to deal, in my official capacity, with two fairly extensive outbreaks of smallpox as well as with a number of minor outbreaks, and I have had, therefore, exceptional opportunities for observing the behaviour of smallpox in the presence of what is largely an unvaccinated population. I have been led to study the question of vaccination from the point of view of those opposed to the practice, as well as from the orthodox medical point of view. Moreover, I was specially interested in the subject of smallpox and vaccination before I came to Leicester.[1]

I first enunciated my present views nearly twelve years ago in a paper contributed to the Public Health Congress at Exeter in 1902, and subsequently, with more confidence, in a paper read before the Society of Medical Officers of Health in 1904.[2] Since that time, with increased experience and further consideration, the views then put forward tentatively and with much diffidence have been further developed and have ripened into convictions.

Outline of the Writer's Position

It will be well, in order to prevent misapprehension, to outline my position with reference to the two contending parties in this controversy.

(1) In the first place, then, I believe absolutely in vaccination, though with certain important reservations, and I differ *in toto* from the Anti-vaccinist when he asserts that vaccination is a "myth" and a "delusion."

I agree entirely with the Pro-vaccinist that recent vaccination confers *on the individual* protection against smallpox which, for practical purposes, is complete though unfortunately only temporary.

(2) I regard vaccination, repeated as often as necessary, as invaluable for protecting individuals who for any reason are specially exposed to the infection of smallpox, *e.g.* smallpox doctors and nurses.

(3) Vaccination is also of very great value for protecting individuals *after* actual exposure to infection, *i.e.* smallpox "contacts." Incidentally, I would point out that for these purposes the question of *duration* of the protection conferred by vaccination is immaterial. It would be almost equally valuable even if it only lasted for a few months.

---

[1] The writer was for a time Resident Medical Officer at the Birmingham Smallpox Hospital during the 1892–3 epidemic in that city, and he chose the subject of smallpox for his thesis (commended) for the M.D. degree. In his early days he once filled the rôle, in a very small way, of popular lecturer on vaccination and newspaper controversialist on strictly orthodox lines.

[2] "The Leicester Method of Dealing with Smallpox," *Public Health*, July 1904.

(4) I agree entirely with the Pro-vaccinist that vaccination has a remarkable power of modifying and mitigating smallpox for many years after its power to protect against attack has worn out. Moreover, the protection conferred by vaccination can be renewed by revaccination.

(5) On the other hand, I agree with the Anti-vaccinist in doubting the value *to the community*, under modern conditions in this country, of infantile vaccination as provided by law. I think that an altogether exaggerated view has been taken as to the effect of such vaccination in preventing *the spread of smallpox*, which is the real problem before us at the present day.

(6) I agree with the Anti-vaccinist that "sanitation"—including in this term notification, isolation, surveillance of contacts, and other modern measures which are now becoming generally adopted—has played a much more important part in the abolition of smallpox from this country during the past thirty or forty years than has infantile vaccination.

(7) I think the Anti-vaccinist is right when he contends that the drawbacks to infantile vaccination and the injuries to health caused by it are not sufficiently recognised by the medical profession, who in their anxiety to defend vaccination have been inclined to minimise these drawbacks.

(8) On the other hand, I quite admit that the Anti-vaccinist in his hostility to vaccination has frequently run into the opposite extreme and greatly exaggerated these drawbacks whilst endeavouring to prejudice the question of vaccination by making wild assertions about the nature and origin of vaccine lymph and its deleterious effect upon human beings.

(9) There is definite evidence that smallpox is leaving this country, in spite of the increasing neglect of vaccination; and I think it probable that this neglect of vaccination will continue until the majority of the population has become unvaccinated. I am inclined to believe that, should this happen, the problem of smallpox prevention will very possibly be simplified and made more easy rather than more difficult. I feel justified, therefore, in regarding the outlook with comparative equanimity, instead of with the serious alarm which appears to prevail with so many of my colleagues in the Public Health Service.

(10) The great difficulty in controlling the spread of smallpox at the present day in this country *is the occurrence of unrecognised*

or "missed" cases of the disease, which spread infection broadcast before any precautions can be taken. Most medical officers of health who have had experience in dealing with smallpox outbreaks in recent times agree as to this, but an important fact, the significance of which does not yet appear to be sufficiently realised, is that these unrecognised cases which do so much mischief, and which go so far to thwart our efforts to control the disease, *occur chiefly amongst persons vaccinated in infancy and because they were so vaccinated.*

In other words, it would seem that infantile vaccination has a distinct tendency to encourage the spread of smallpox, which goes far to neutralise any benefit which the community might otherwise derive from the fact that such vaccination largely protects the child population against the disease. I propose in a later chapter to enter more fully into this aspect of the case, which hitherto has been but little considered.

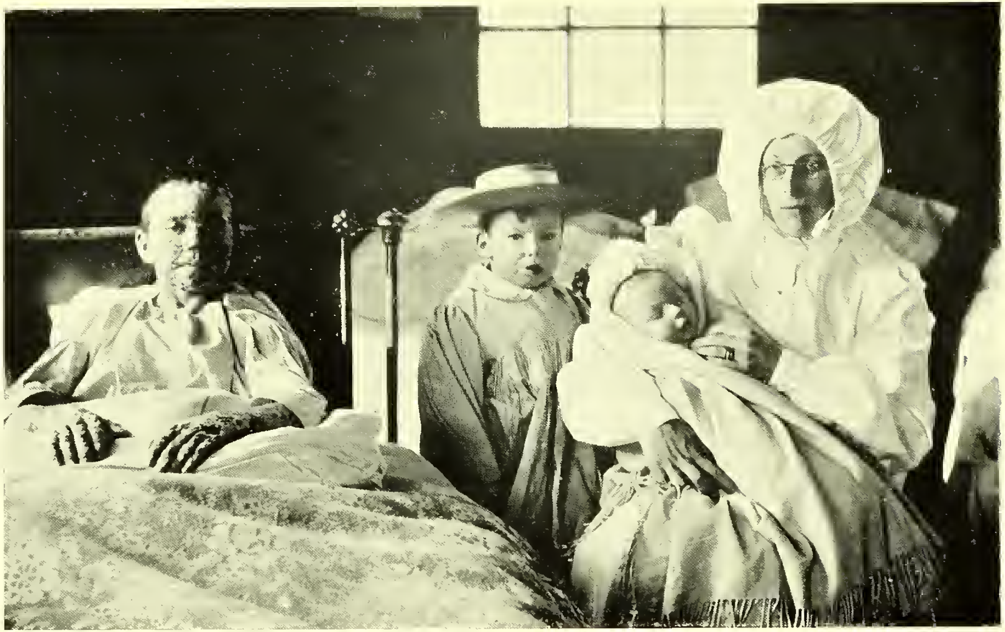
Visit of the Writer's Family to the Smallpox Hospital

I gave a very practical demonstration of my belief in the power of recent vaccination to confer complete immunity on the individual during the course of the 1903 epidemic of smallpox in Leicester. I took my wife and two children, the latter aged six months and two years respectively, all recently vaccinated, to the Leicester Smallpox Hospital, and there, in a ward full of patients, I photographed them sitting by the bedside of a confluent case of the disease. I then took the elder child and visited each of the wards, stopping to introduce him to the patients.

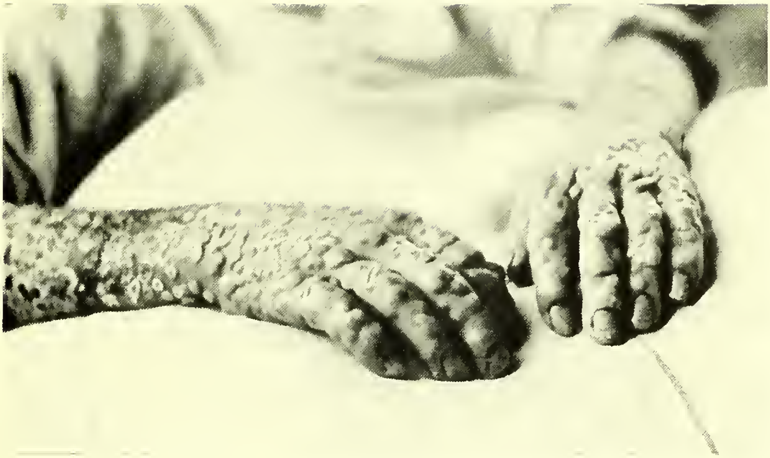
It is scarcely necessary to add that neither my wife nor the children were the least bit the worse for their little adventure.

Of course, I do not suggest that the visit of my children to the smallpox hospital constituted in itself any actual proof of the efficacy of vaccination. It was merely a proof of the genuineness of my belief, and that of my wife, in its efficacy. At the same time, I may say that in endeavouring to persuade "contacts" to get vaccinated I have found the photograph which I obtained on the occasion in question of very great assistance in bringing home the value of vaccination, and I believe it was more efficacious in overcoming scepticism than any other argument at my disposal.

PLATE I



RECENTLY VACCINATED PERSONS NEED NOT FEAR SMALLPOX
The author's wife and family, all recently vaccinated, visiting the Leicester Smallpox Hospital.



The hands and forearms of the smallpox patient seen in Plate I.
The case was of the confluent type.

CHAPTER II

THE VACCINATION QUESTION IN DETAIL

Distinction between Individual and Community—Vaccination a Protection to Individual—An Error of Tactics—The Real Question at Issue—Effect on Community—Smallpox Leaving Great Britain Independently of Vaccination—Mortality during Past 150 Years—Modern Methods of Dealing with Smallpox—Isolation, Notification, Surveillance of Contacts, etc.—Relative Risks of Vaccination and Smallpox—Vaccination not Ideal—Risk of Infants Contracting Smallpox Over-estimated—Infantile Vaccination Alone Quite Insufficient to Protect Community—Tendency of Vaccination to Spread Smallpox—Revaccination.

In this chapter I shall consider in rather more detail the position outlined in the previous chapter.

The Distinction between the Individual and the Community

It is necessary at the outset to insist upon the importance of making a clear distinction between the effect of vaccination upon the individual and the community. Neglect to recognise this distinction has been the cause of much confusion and futile controversy and largely explains why each side arrives at such opposite conclusions as to the so-called effect of vaccination in preventing smallpox.[1]

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[1] *The Analogous Case of Inoculation.*—It is sometimes urged, as a logical sequence, that the effect of vaccination upon the community must be the same as its effect upon the individual, since the community is composed of individuals. In order to show the fallacy of this deduction, we may cite the analogous case of inoculation. Undoubtedly, inoculation had a beneficial effect upon the individual, conferring protection upon him against the natural disease which, at the period when inoculation was introduced, was a very serious danger. But it was afterwards discovered that although inoculation protected the *individual* it certainly did not protect the *community*. Indeed, it was found to have the very opposite effect and to tend to spread the disease. It will be instructive

1. Vaccination has, Beyond all Doubt, so far as the Individual is Concerned, a Protective Influence against Smallpox

I regard this proposition as axiomatic. Practically the whole of my case is based upon it, and I may say at once that I do not propose to adduce any evidence in support of it or to attempt to prove it. My justification for taking this course must be that I think it a pity to spend time in proving a proposition which *has already been proved over and over again.*[1] Far too much time and energy have been spent and, as I consider, wasted in the course of this controversy over this one salient point. Both sides appear to have regarded it as the key to the whole question at issue, and in almost every controversial battle over vaccination the fight has raged hottest and most furiously round

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to pause to consider why inoculation failed so conspicuously to protect the community. If smallpox infection had been almost universal—if it had been the case that every individual who was susceptible to it was bound to contract the disease at some period of his life—then inoculation, by substituting a comparatively trifling illness for a serious, loathsome, and possibly fatal one, would have been a great blessing to the community. Or had it been the case that inoculation was so universally practised that every one was protected by it, it would at least have done no harm in the way of spreading the disease to others. But as a matter of fact neither of these conditions obtained. On the one hand, only a certain proportion of the population—chiefly the upper classes, with whom the cost would not be a deterrent—availed themselves of inoculation ; whilst, on the other hand, smallpox infection was not ubiquitous. Remote districts often escaped visitations of smallpox for long periods, and many susceptible persons went through life without contracting the disease. To persons who were not inoculated inoculation, in other persons, became a real source of danger by introducing the infection of smallpox into localities which otherwise might have remained free from it. I suggest that the effect of vaccination will be found in some respects to be quite analogous to that of inoculation.

[1] I feel the more justification for adopting this course and dismissing this part of the vaccination question thus summarily, as I am conscious of having given close and sympathetic attention to the case for anti-vaccination for many years.

As to the nature and extent of the protective influence of vaccination upon the individual, I accept the finding of the Royal Commission on Vaccination, as stated in Section 377 of the Final Report, my only reservation being that the period of "highest protective potency" is certainly not as much as ten years, as suggested by the Commissioners. I agree with other observers that five years is probably nearer the mark.

this particular position. Now if this position—viz. the protective influence of vaccination upon the individual—really be the key to the whole question, then I regard the anti-vaccinist as hopelessly defeated without the shadow of a chance of success, for I am *absolutely certain that this position is quite impregnable.* I am sorry to seem dogmatic, but I am anxious to prevent misapprehension as to where I stand. It is the only point on which I shall venture to insist with the same emphasis. Even the most brilliant scientific champions of the anti-vaccinists fail to support them in denying this protective influence of vaccination upon the individual. Thus, Professor E. M. Crookshank, in his evidence before the Royal Commission on Vaccination,[1] admitted that there was a " temporary antagonism " between cowpox (vaccinia) and smallpox, which lasted for two or three years, and which explained why inoculation with smallpox would not " take " in a person who had been previously vaccinated; and the Dissentient Commissioners, in what is known as " The Minority Report " of the Royal Commission, practically admit the same thing. They say (Sect. 125): " It would appear from the foregoing facts that while shortly after vaccination there may be a certain amount of immunity or antagonism to the influence of renewed vaccination or inoculation with smallpox, and therefore, it may be argued, to the natural disease, this soon wears off, perhaps more rapidly in some than in others." If it will make the proposition more acceptable to anti-vaccinists I will willingly substitute the phrase " temporary antagonism " for " protective influence," for it will suit my argument equally well. Moreover, the exact duration of this " temporary antagonism " is immaterial, though it is only right to observe that, as admitted by Professor Crookshank, it lasts for a period of years.

An Error of Tactics

Now it seems to me a very serious error of tactics, to say the least of it, on the part of the anti-vaccinists to ignore this evidence of Prof. Crookshank, and to continue to deny, or to try to explain away, this temporary antagonism between vaccinia and smallpox as so many of them do. Obviously, if there be this temporary antagonism which is sufficient to prevent taking smallpox even though the disease be actually inoculated (the severest of all tests), and which lasts for some years, it is a fact of great significance and importance and entirely refutes the anti-vaccinist assertion that vaccination is a "myth" or a "grotesque superstition." It may be "magnificent" to hurl oneself heroically against an impregnable position, but it is "not war," and I have no doubt that this fatal error accounts very largely for the little real progress which is being made by the anti-vaccinist movement in the way of converting scientific opinion.

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[1] Fourth Report R.C.V., p. 93.

The Real Question at Issue

But I wish to suggest that this particular point, viz. the protective influence of vaccination upon the individual—important though it undoubtedly is—*is not the key to the whole vaccination question.* The real issue, as I submit, is the effect of vaccination *upon the community*; and though the anti-vaccinists are certainly in error on the first point it by no means follows that they are beaten all along the line. I think I can show that there is a flanking movement open to them by which the impregnable position of the pro-vaccinist can be "turned," so to speak, and ultimate victory be achieved, so far at least as the abolition of compulsion is concerned.

(2) The Effect of Vaccination upon the Community is a Variable Quantity

My next proposition is that the effect of vaccination upon the community, as distinct from its effect upon the individual, is a variable quantity and depends largely upon circumstances. In the first place it is important to define what we mean by "vaccination." Do we mean a system of incomplete infantile vaccination such as exists in this country; or do we mean a more or less complete system of vaccination and re-vaccination such as exists in Germany? I think I shall be able to show that the effect of only *partially* protecting a community—which is all that even the most efficient system of infantile vaccination can ever accomplish—may possibly be productive, under certain circumstances, of more harm than good. Certainly, it must be admitted that such a system alone is quite ineffective so far as preventing widespread and fatal epidemics of smallpox is concerned, as witness the experience of Middlesbrough and other well-vaccinated towns.

Secondly, the effect of vaccination upon a community depends upon the position of that community in regard to smallpox prevalence and smallpox prevention independently of vaccination. Thus, at the beginning of last century, the effect of vaccination in the town of Leicester, where smallpox, as in the rest of the country, was a terrible scourge and was allowed to spread quite unchecked, would be totally different from what it would be now, when the prevalence of smallpox has been so enormously reduced and " sanitation " so greatly improved.

Similarly, the effect of vaccination, even at the present day, in such countries as India or China, where the disease is endemic, will be totally different from what it is in this country. It is quite logical to suggest that it may be almost useless or even detrimental here, although an incalculable boon there.

Again, the effect of vaccination would be different in towns such as Warrington or Gloucester, which were more or less insanitary and admittedly unprepared to deal with smallpox by means other than vaccination, from what it would be in a sanitary and comparatively well-equipped town, such, may I say, as Leicester ?

It is, of course, no new idea that an institution may be beneficial in one age, and yet become out-of-date, obsolete, and even positively harmful at a later age.

(3) Smallpox is Disappearing from Great Britain Independently of the Practice of Infantile Vaccination

It will be necessary to consider this, my third proposition, in some detail, as it is evidently a fundamental one. If it can be established, it must materially affect our whole outlook as to the necessity for vaccination as a State institution.

The two crucial and outstanding facts which I wish to lay stress upon, are :

(*a*) The unexpected and remarkable experience of the town of Leicester, which for thirty years has abandoned infantile vaccination and yet has shown an enormous decline in smallpox mortality.

(*b*) The fact that although infantile vaccination is falling more and more into disuse throughout the whole country, yet smallpox, contrary to all pro-vaccinist expectation and prophecy, continues to decline and has now almost disappeared. The disease is repeatedly being introduced into this country from abroad, there is an increasing number of unvaccinated persons to contract it, yet it is showing an unmistakable disinclination to establish itself in this country in serious epidemic form. It is useless for us to shut our eyes to these facts much longer. I submit that any one who takes a calm and unprejudiced survey of the whole history of smallpox in this country will be forced to the conclusion that this disease is following a number of other zymotics—*e.g.* leprosy, cholera, plague, typhus—which at one time were a scourge and a terror in these islands, but have now practically disappeared.[1]

In saying this I do not wish to suggest that we have seen the last of smallpox epidemics. There are still many weak places in our national armour, and our weapons of defence against the disease are very far indeed from being perfect. But we are gaining experience with every fresh visitation. There has not been a single widespread epidemic of smallpox during recent years but has taught some useful lesson and left the affected district better prepared to deal with the disease in future.

I think it may reasonably be claimed that we now know better how to deal with smallpox (apart from the question of infantile vaccination) than with any other zymotic disease.

Smallpox Mortality in the British Isles during the Past 150 Years

Let us now take a general bird's-eye view of smallpox mortality in this country during the past 150 years (Diagram I). Death registration only began with the year 1838, so that prior to that date it is usual to take the London Bills of Mortality as the best available index of the ravages of smallpox during

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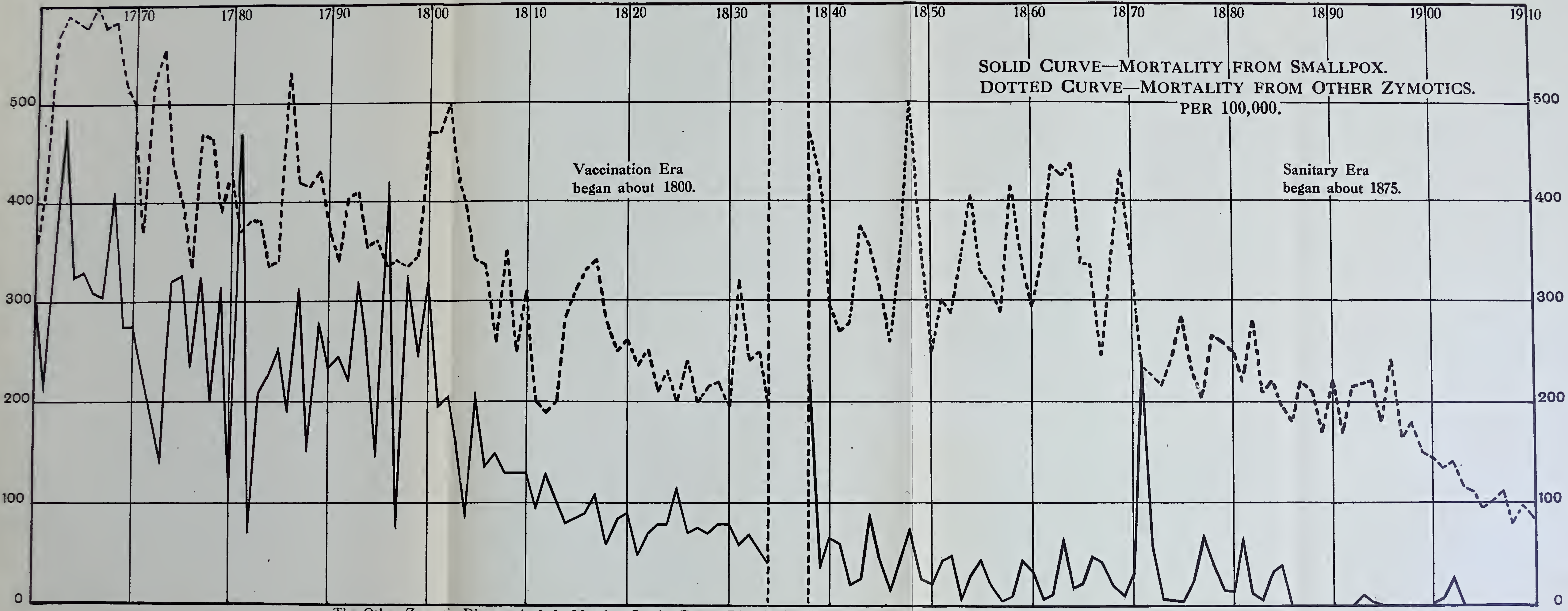
[1] Enteric fever also appears to be going, whilst scarlet fever has ceased to be a serious cause of death.

DIAGRAM I.

MORTALITY FROM SMALLPOX AND OTHER ZYMOTIC DISEASES IN LONDON, 1760 TO 1910.



The Other Zymotic Diseases include Measles, Scarlet Fever, Diphtheria, Whooping Cough and "Fevers."
The first half of the diagram is after A. R. Wallace. The latter half has been constructed from the figures given by the Registrar General.

the eighteenth and the beginning of the nineteenth century. Although the London Bills only refer to burials within the City of London, where smallpox certainly caused a much higher average mortality than throughout the country generally, yet for the purpose of studying the progress of the disease from year to year they are quite sufficient. The first half of Diagram I is based on the figures for smallpox given in the London Bills,[1] and is after A. R. Wallace.[2] It shows graphically the number of deaths from smallpox in London in each of the years 1764–1834. For comparison, the deaths from other zymotic diseases (measles, scarlet fever, diphtheria, whooping cough, and "fevers") are also shown.

It is clear that the mortality from both causes fell very remarkably, and that in the case of smallpox as well as in the case of "other zymotics" the decline had set in before the end of the eighteenth century—in other words before the beginning of the vaccination era.

Jenner's discovery, it will be recalled, was published in 1798, and the practice of vaccination hardly became general until several years after that date.

During the earlier part of the nineteenth century, the drop in smallpox mortality was certainly very marked, and, personally, I am quite satisfied that the introduction of vaccination contributed largely to this drop. If we accept the proposition that vaccination confers upon the individual for a few years complete immunity to the disease, and subsequently modifies the severity of the attack, then, at a time when smallpox overran the country, it almost necessarily follows that a reduction in mortality must have ensued. But it by no means follows that the *whole* of the reduction was due to the introduction of vaccination. Assuming, as I think we must, that a decline in smallpox mortality had already begun before the introduction of vaccination, it is quite reasonable to suggest that, whilst vaccination hastened the fall, the decline would have continued even without vaccination and would ultimately have reached the same point, though not so soon. Moreover, it will be noticed that the drop in the mortality from "other zymotics" was

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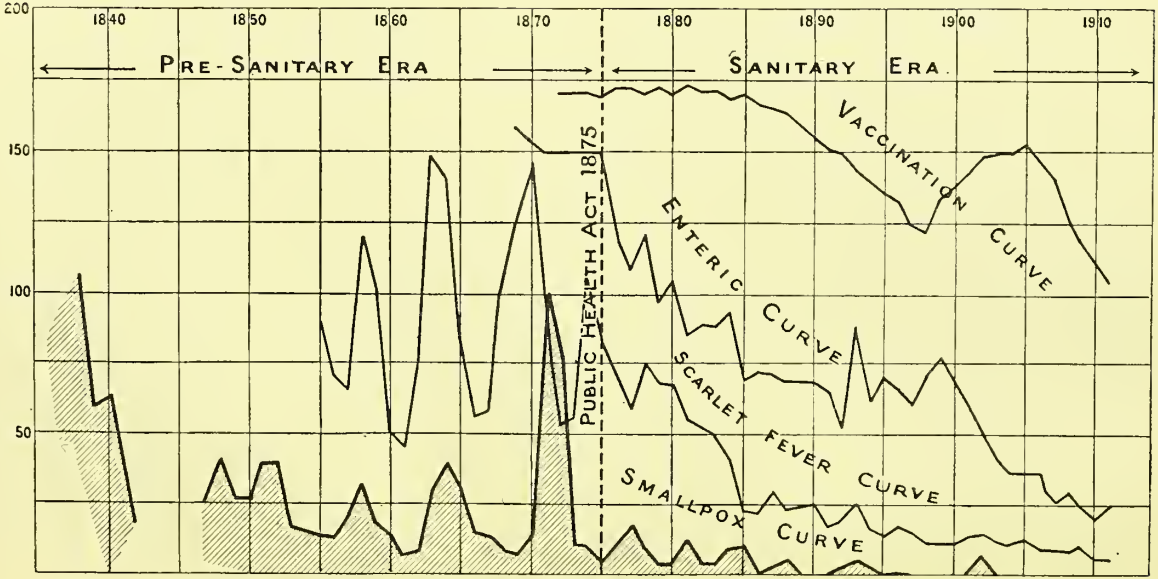
[1] Second Report R.C.V.

[2] See Diagram I in *Vaccination a Delusion*, by A. R. Wallace, LL.D., D.C.L., F.R.S., etc.

DIAGRAM II

Smallpox, Scarlet Fever, Enteric, and Vaccination, England and Wales

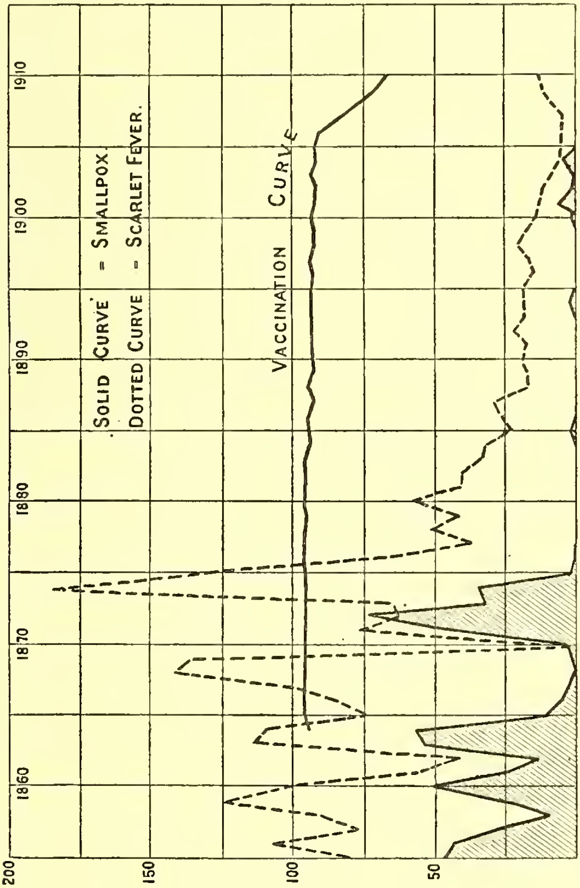


Smallpox, Scarlet Fever, and Enteric curves indicate mortality per 100,000 population. Vaccination curve indicates vaccinations per 200 births. From figures given in Final Report, R.C.V., and in Annual Reports of Registrar-General.

almost as striking. So much is this the case, that, without being informed, it is difficult to tell which line represents smallpox, and which "other zymotics." Obviously, causes other than vaccination must have been at work to have produced this fall in "other zymotics," and we cannot say that the same cause did not also influence the mortality from smallpox.

DIAGRAM III

SMALLPOX, SCARLET FEVER AND VACCINATION, SCOTLAND



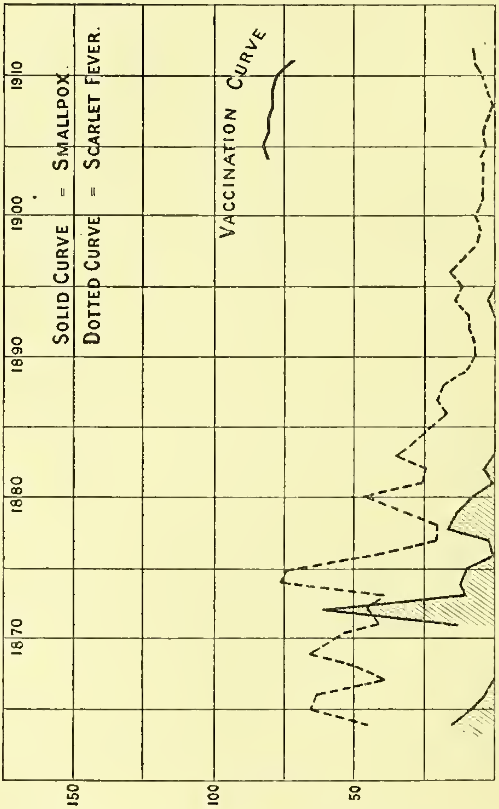
Smallpox and Scarlet Fever curves indicate mortality per 100,000 population. Vaccination curve indicates vaccinations per cent. of births. From figures given in Final Report, R.C.V., supplemented by figures supplied by Registrar-General for Scotland.

It will next be noticed that as the century advanced, in spite of the increasing use of vaccination, the decline in smallpox mortality became much less marked. This is easily accounted for by the fact that after the lapse of years all those persons vaccinated in the earlier part of the century were gradually losing their protection and again becoming susceptible to fatal smallpox.

The London Bills of Mortality only take us up to about the year 1834, but in 1838 systematic registration of deaths was instituted, so that from that time onwards we have the returns of the Registrar-General to guide us. The second half of Diagram I has been constructed from the Registrar-General's figures,[1] and shows graphically the mortality from smallpox and other zymotics per 100,000 population. It will be observed that the mortality from smallpox continued to fall, though not very rapidly and with considerable fluctuations, until the year

DIAGRAM IV

Smallpox, Scarlet Fever, and Vaccination, Ireland



Smallpox and Scarlet Fever curves indicate mortality per 100,000 population. Vaccination curve indicates vaccinations per cent. of births. From figures given in Final Report, R.C.V., supplemented by figures supplied by Registrar-General for Ireland.

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[1] Taken from the Final Report of the Royal Commission on Vaccination, pp. 32, 43.

1871. It was then that this country, and indeed the whole of Europe, had such a rude awakening as to the total inadequacy of infantile vaccination, as then being practised, to protect the country from a terrible visitation of smallpox. The great extent to which London suffered is seen in the diagram.

Diagrams II, III, and IV show the smallpox mortality curves for England and Wales, Scotland, and Ireland, together with curves showing the mortality from scarlet fever. In each diagram the great leap in the smallpox mortality in the years 1871–3 is at once apparent. We notice in the scarlet-fever curve also remarkable exacerbations, very little less remarkable than those in the case of smallpox.

All of the three last diagrams being drawn to the same scale, it will be seen that there is a marked difference in the extent to which each of the three divisions of the United Kingdom has suffered; England and Wales having suffered most, then Scotland, and Ireland least of all. Ireland has also suffered less from scarlet fever than either of the two other countries. Now it can hardly be contended that this difference in smallpox mortality has had anything to do with vaccination. As a matter of fact it would appear that in the past Ireland was less efficiently vaccinated than either Scotland or England and Wales. There can be little doubt that the real explanation is to be found in the difference in density of population in the three countries; Ireland, of course, being the least populous, Scotland coming next, and then England and Wales. The same explanation accounts for the fact that smallpox mortality in London (and in other great towns) was worse than in the country as a whole.

But density of population must be included in the term "sanitary condition," using that term in its broadest sense; so it would seem that "sanitary condition" may have more to do with the incidence of smallpox mortality than the mere question of the efficiency or otherwise of infantile vaccination.

We now come to the period from 1873 down to the present time. This may rightly be called the "Sanitary Era," as it is only during this period that the science of modern sanitation has come into existence. The great Public Health Act—passed in 1875—may well be taken as marking the beginning of this era. True, this was not the first Act relating to the Public Health, nor the first attempt that had been made to improve the wretched state of things existing. The dawn of sanitation had already appeared. But if any particular date is to be taken as marking the effective beginning of the "Sanitary Era," the year 1875 may well be selected.

Modern Methods of Dealing with Smallpox

It is only since this date that those modern measures[1] for dealing with smallpox, which are now almost universally carried out in this country, with more or less efficiency, came into operation. It will be well to refer to the more important of these separately.

(a) *Hospital Isolation.*—It is only about forty years since the practice of isolating smallpox in special hospitals was begun. This marked a new era in the campaign against the disease, and we shall refer to it in more detail later. At first, however, smallpox hospitals, placed, as they usually were, in the midst of populous localities, overcrowded with patients and indifferently administered, were undoubtedly often a great source of danger to the surrounding population. It was many years before this was fully recognised, and it is only since smallpox hospitals have been moved outside the towns that the full advantage of hospital isolation has been obtained. A striking illustration of this is seen in the case of London. A very marked drop in smallpox mortality followed the removal of the smallpox hospitals outside the Metropolitan area in 1885.

(b) *Notification.*—Again, hospital isolation could only be really effective when supplemented by compulsory notification of the disease. When it is considered how much importance nowadays is attached to the early notification of smallpox if modern measures of prevention are to be of any use, it is astonishing to think that it was as recently as 1901 that the notification of infectious disease was made compulsory for the whole country, although most large towns had obtained compulsory powers by local Acts earlier than this. Leicester was one of the pioneers in this respect and obtained a compulsory Notification Act (in the face of considerable opposition from the medical profession) as early as 1878. A great city like Sheffield, on the other hand, was without these powers as late as 1887, and depended upon a voluntary system, with the result that when smallpox visited the city in that year only one-fourth of the thirty-two cases known to have occurred during the first three months of the outbreak were notified. It is scarcely surprising that the disease spread and that a serious epidemic resulted.

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[1] An excellent account of the modern methods of dealing with smallpox is given in a little book, recently published, by Dr. W. McC. Wanklin, *The Administrative Control of Smallpox.*

(c) *Surveillance of Contacts.*—Still more recently the method has been adopted of carefully searching out all individuals who have been in contact with cases of smallpox and keeping them under strict supervision until the end of the incubation period, so that in the event of symptoms of the disease appearing, they can at once be removed to hospital before infecting others. This method is undoubtedly of the very first importance. In Leicester and some other towns "compensation" is paid to contacts for staying away from work. Further reference will be made to this part of our subject in Chapter VIII, when dealing with the "Leicester Method."

(d) *Disinfection of Houses and Clothing.*—Little need be said about this. It is now almost universally practised after smallpox, and when clothing cannot be efficiently disinfected it is generally destroyed.

(e) *Visitation of Lodging-houses.*—It has also now become the general practice in large towns for inspectors to systematically visit common lodging-houses when smallpox is about, and many cases of the disease in tramps, which otherwise might have caused outbreaks, have thereby been discovered.

(f) *Interchange between Different Sanitary Districts of Information regarding Smallpox Cases and Contacts.*—It is difficult to over-estimate the importance of this modern measure. Port Sanitary Authorities now systematically forward to the districts concerned the names and addresses of any contacts landing from abroad.[1]

Other important though minor measures for dealing effectively with smallpox have been introduced and perfected during this "Sanitary Era," and, in addition, the general sanitary condition—including especially in this term overcrowding and standard of living—of almost every town has been very greatly improved, as evidenced by the reduced death-rate and infantile rate, and the reduced mortality from other zymotic diseases. It seems reasonable to contend that all this has contributed very largely to the remarkable reduction in smallpox mortality which has taken place during the period we are now considering. I do not suggest that the whole of the decline has necessarily been due to "sanitation," because it is quite possible that other and more subtle causes—causes which we cannot analyse, but which may be referred to as "epidemic influences"—have been at work. It is well known that some diseases tend to disappear just as others tend to increase (*e.g.*, cerebro-spinal meningitis, and acute polimyelitis) without any assignable cause. But, whatever the cause, there seems to me to be no satisfactory reason for thinking that infantile vaccination has played any great part in the reduction in smallpox mortality. The striking facts that in Leicester, without infantile vaccination, the decline has been greater than in most places, and that throughout the country smallpox has continued to decrease in spite of the falling off in vaccination, should surely be sufficient grounds for legitimate doubt.

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[1] An instance of the value of this occurred recently in Leicester. Information was sent by the M.O.H. for Liverpool of the arrival of a smallpox contact in Leicester, from Brazil. The contact developed smallpox, but, being under observation, no spread of infection occurred.

The Relative Risks of Vaccination and Smallpox

It cannot be denied that vaccination causes, in the aggregate, very considerable injury to health, most of it only temporary, but some permanent. It is true that the deaths certified as due to vaccination are less numerous now than they used to be, but some deaths still occur every year. In the twelve years ending 1910 (*i.e.*, since the substitution of calf lymph for human lymph) there were 251 of these deaths in England and Wales. But in addition to the deaths certified as directly due to vaccination there are certainly others indirectly due to it which are not so certified. In any case we have no official statistics as to the number of children whose health has been temporarily or permanently injured short of a fatal result. I have certainly no wish to exaggerate the injuries caused by vaccination. Compared with an average attack of unmodified smallpox an attack of cowpox is usually a trifling matter. Whenever there is a grave risk of contracting the more serious disease, as in the case of persons who have been exposed, or are likely to be exposed, to the infection of smallpox (*e.g.* smallpox contacts and smallpox nurses) it is infinitely better to accept the lesser evil in order to escape the greater. At the same time we must never forget that vaccination *is* an evil. Vaccinia is just as much a disease as smallpox, though a less serious one, and all disease must be regarded as evil and to be avoided if possible. There is not the slightest evidence that vaccination, apart from its effect in preventing smallpox, is of the least value or anything but detrimental to the human race.

But now that the risk of being exposed to the infection of smallpox, or at least of contracting the disease, has become very remote, owing to the enormously reduced prevalence of the disease, it becomes an open question whether the risk incurred by vaccination is not too heavy a premium to pay for the sake of being ensured against the risk of smallpox. If only the immunity conferred by vaccination really lasted for a lifetime, as Jenner hoped and at first asserted, the price to be paid for the insurance would be a matter of less importance. But it is quite certain that vaccination, to be reasonably effective through life, must be repeated.

During the last decade the deaths from vaccinia have several times outnumbered those from smallpox, whilst if we have regard to the amount of ill-health caused by the two diseases (and putting aside for the moment the question of the alleged effect of vaccination in lessening smallpox) it looks as if vaccinia were becoming, so far as the community is concerned, the more serious disease of the two.

The Principle of Vaccination not Ideal

Twelve years ago I wrote[1]: "It must never be forgotten that vaccinia is, after all, a disease, and those of us whose profession it is to prevent disease should be ready to abandon it at the earliest possible moment consistent with the public safety. The control of disease by the substitution of one disease for another, whilst it may be expedient, can never be regarded as an ideal method; and, whilst I fully recognise the immense and lasting utility of vaccination under certain circumstances (*e.g.* after exposure to infection), I venture to suggest that universal *compulsory* vaccination need only be regarded as a temporary expedient."

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[1] In a paper read at the Public Health Congress at Exeter, in 1902.

At that time, with my limited experience, I was not prepared to go nearly so far in recommending the abolition of compulsory vaccination as I am to-day, but the assertion that the principle of preventing disease by the substitution of one disease for another was not ideal was as definite then as it is now, and I have nothing to add to it.

The Risk of Infants Contracting Smallpox

Before leaving this aspect of the subject I would mention that I believe the risk of infants contracting smallpox, in places where infantile vaccination is neglected, has been very much over-estimated. Even during times of epidemic in Leicester it is surprising how few infants have contracted the disease. During the epidemic of smallpox in Leicester in 1892–3, out of 365 cases which occurred, the number of unvaccinated infants attacked was only 6, 1 of whom died. Again, in the 1903 epidemic, out of 394 cases there were 4 infants, 2 of whom died; whilst in the epidemic of 1904, out of 321 cases, 6 were infants, 2 of whom died. Moreover, several of these were below the vaccination age, so would not necessarily have been protected, even if infantile vaccination had been in force in Leicester.

I recognise, of course, that during the epidemics in question the number of infants vaccinated was greater than usual, but this was not the result of compulsion, but rather in spite of it, and is certainly no argument for compelling all infants to be vaccinated whether smallpox is prevalent or not.

The late Dr. F. T. Bond of Gloucester, Founder and Hon. Sec. of the Jenner Society, became so satisfied that the danger of infants contracting smallpox, even though unvaccinated, was not very serious, that he, in conjunction with Mrs. Garrett Anderson, M.D., the Hon. Sec. of the Imperial Vaccination League, actually advocated the extension of the age limit for vaccination to six years.

Infantile Vaccination Alone, however Efficiently Enforced, can Never be Depended upon to Protect the Community

I do not think that any one who has studied the subject will deny that infantile vaccination alone is quite insufficient to protect a community from smallpox, no matter how efficiently it be carried out. If any doubt exists we have only to point to the experience of well-vaccinated towns such as Sheffield, Warrington, Liverpool, or Middlesbrough, before modern preventive measures were efficiently practised, and when infantile vaccination alone was chiefly depended upon. We shall consider the case of these towns in Chapter IV. It will suffice to say here that, although infantile vaccination had been carried out with exemplary thoroughness, very severe epidemics of smallpox occurred and caused heavy loss of life.[1]

Infantile Vaccination has One Serious Drawback ; Whilst Mitigating Smallpox it also Disguises it, and in this way Tends to Spread the Disease.

I regard this proposition of so much importance, and it has hitherto received so little attention, that I propose to devote a separate chapter to its consideration.

Re-vaccination

As we are taking it as proven that vaccination confers complete immunity against smallpox for a time, and that such immunity can be renewed as often as desired by re-vaccination, it follows as a logical sequence that if *all* the individuals in a community were vaccinated and re-vaccinated *often enough,* smallpox could not exist. This is exactly what happens in the case of the staff of a smallpox hospital. In practice two re-vaccinations, making three vaccinations altogether in a lifetime, would no doubt be sufficient. In Germany there is universal re-vaccination at school-age, followed by a third vaccination of all males on entering the army. Smallpox mortality in Germany, as in Great Britain, has been reduced to a minimum, though sanitation in Germany, as well as vaccination, must receive some of the credit. Still, I am quite prepared to admit that *a complete system of universal vaccination and re-vaccination and repeated re-vaccination, if such could be efficiently carried out, would abolish smallpox from any country in the world.*

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[1] I quite admit, of course, that had these towns been less well vaccinated the mortality caused by these epidemics would almost certainly have been higher. All I am contending for here is that infantile vaccination alone is quite insufficient.

The important question to consider in this connection, however, is whether such a drastic measure is *really necessary* for the effective control of smallpox, for unless it can be shown that it is, it would be most unreasonable to expect a civilised community to submit to it.[1] In the United Kingdom I am satisfied that such a measure is not necessary. We have done without it all these years and we are better prepared to-day to deal with smallpox by measures other than vaccination than ever before. Certainly, no Government is likely to incur the unpopularity of attempting to pass a compulsory re-vaccination law, nor is there any likelihood that such a law could be enforced even if it did succeed in finding its way on to the Statute Book. As a matter of fact, it is now frankly admitted, even by the most extreme pro-vaccinists, that general re-vaccination of the community is no longer a question of practical politics.

A further reference to the subject of re-vaccination is made in the final chapter.

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[1] It would appear that a revolt against vaccination is being threatened, even in Germany. A big debate took place in the Reichstag recently, and a motion to abolish compulsion was only defeated by a small majority.

CHAPTER III

THE ROYAL COMMISSION ON VACCINATION

A Remarkable Inquiry—The Terms of Reference—Findings of the Commission—Majority Report—Effect of Vaccination in Preventing Smallpox—Conclusions of Commissioners as to Protective Effect—Means other than Vaccination for Preventing Smallpox—Value of Hospital Isolation—Opinion of Buchanan and Thorne—Experience of London—Means for Preventing Ill-effects of Vaccination—Question of Compulsion—Minority Report.

I PROPOSE to limit the scope of this book by confining myself as far as possible to the experience of smallpox which has been gained since the time of the Royal Commission on Vaccination.

We may regard the present inquiry, therefore, as starting at the point where the Royal Commission left off. I shall devote the present chapter to a consideration of the finding of the Commission, and of the conclusions arrived at.

Reference will be made in a later chapter to the part played by the town of Leicester in connection with the Royal Commission.

The Royal Commission on Vaccination certainly represents by far the most exhaustive inquiry ever held in connection with the subject of vaccination [1] and constitutes a landmark in the history of our subject. It was, indeed, one of the most remarkable inquiries ever held in connection with any subject. Appointed in the year 1889, the Final Report was not published until 1896, seven years later. This delay is not surprising, considering the enormous volume of evidence recorded. The Commissioners held 136 meetings, and examined 187 witnesses.

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[1] The following comment in *The Lancet* (April 13th, 1889) on the proposal to appoint a Royal Commission illustrates the "made-up" attitude of mind with which many regarded the question of vaccination :

"It is about as rational to investigate the merits and value of vaccination as it would be to question the utility of lifeboats, or Davy lamps, or fire brigades."

In addition, they caused important investigations to be made for their assistance. The examination of certain individual witnesses occupied several whole days. The total number of questions put and answered was over 18,000. Some idea of the mere bulk of the reports issued is obtained from the fact that the five principal reports, consisting of closely printed matter, together with the eight bulky appendices, weigh altogether over 14 lb. avoirdupois! The Commissioners, under the able chairmanship of Lord Herschell, certainly did their work with commendable thoroughness, and their reports constitute a veritable storehouse of facts relating to vaccination; but, unfortunately, much valuable evidence is virtually buried in this great mass of material.

The Terms of Reference

The Terms of Reference to the Commission were as follows:

"To inquire and report as to:

"(1) The effect of vaccination in reducing the prevalence of, and mortality from, smallpox.

"(2) What means other than vaccination can be used for diminishing the prevalence of smallpox; and how far such means could be relied on in place of vaccination.

"(3) The objections made to vaccination, on the ground of injurious effects alleged to result therefrom; and the nature and extent of any injurious effects which do, in fact, so result.

"(4) Whether any, and if so, what means should be adopted for preventing or lessening the ill-effects, if any, resulting from vaccination, and whether, and if so, by what means vaccination with animal vaccine should be further facilitated as a part of public vaccination.

"(5) Whether any alterations should be made in the arrangements and proceedings for securing the performance of vaccination, and, in particular, in the provisions of the Vaccination Acts with respect to prosecutions for non-compliance with that law."

The Finding of the Royal Commission

In spite of the pains taken to arrive at a unanimous verdict, the Commissioners were divided in their conclusions and recommendations. Out of the thirteen Commissioners who survived the inquiry, eleven signed the Final Report (often referred to as the Majority Report) though four with reservations; whilst two—Dr. W. J. (now Sir William) Collins and Mr. J. A. Picton—issued an exhaustive statement (commonly referred to as the Minority Report) setting forth the grounds of their dissent. The two Reports may be regarded as constituting the most authoritative statement on the vaccination question available from the pro-vaccinist and anti-vaccinist point of view respectively. It is noteworthy that both are much more cautious and less extreme in tone than the statement of the case as often put forward by more irresponsible and reckless protagonists. Moreover, it will be found on close examination that there is comparatively little real difference between the two Reports as regards matters of fact.

The Majority Report extends to 141 pages, and the Minority Report to 65 pages. Both Reports are valuable scientific documents, and may be regarded to some extent as the complement of each other.

The Majority Report

We will first consider the finding of the Majority Report.

Reference 1. The Effect of Vaccination in Reducing the Prevalence of, and Mortality from, Smallpox

This was the first and certainly the most important of the questions referred to the Commissioners. It raised at once the whole question of the utility of vaccination to the *community*, but not, be it observed, of its utility to the individual. To have referred to the individual the reference ought to have been worded something as follows: "The effect of vaccination in reducing the risk of attack by, or of death from, smallpox." It is probable that the importance of distinguishing between the effect upon the individual and upon the community was not at all appreciated at the time the Royal Commission was appointed. But, however that may be, it is certain that the problem set before the Commission to solve was the effect upon the *community*, and they approached it chiefly, if not entirely, by endeavouring to establish what the effect was upon the *individual*.

That this was really the case is clearly shown by their answer to this first and most important reference. Instead of saying definitely that they believed vaccination was reducing the prevalence of, and mortality from smallpox, they evade the real issue by saying (Sect. 365): "We proceed then to sum up the evidence bearing upon the question *whether vaccination has any, and if so what, protective influence in relation to smallpox,* and to state the conclusions at which we have arrived" (italics have been added).

Now, I would specially draw attention to the fact that this question "whether vaccination has any, and if so what, protective influence in relation to smallpox," *was not one of the terms of reference at all.* Yet the greater part of the Majority Report is devoted to—I had almost said, wasted in—settling it. No doubt, the fact that the opponents of vaccination denied that it had any protective influence accounts for so much effort being made to establish this point, but none the less, I submit that the conclusion arrived at constitutes no satisfactory answer to the all-important question submitted as to the effect of vaccination in reducing the prevalence of, and mortality from, smallpox.[1]

The Conclusions of the Commissioners as to Protective Effect upon the Individual.—The Commissioners then proceed to state their conclusions as to the protective effect of vaccination as follows (Sect. 377): "It has appeared to us impossible to resist the conclusion that vaccination has a protective effect in relation to smallpox.

"We think:

"(1) That it diminishes the liability to be attacked by the disease.

"(2) That it modifies the character of the disease, and renders it (*a*) less fatal, and (*b*) of a milder or less severe type.

"(3) That the protection it affords against attacks of the disease is greatest during the years immediately succeeding the operation of vaccination. It is impossible to fix with precision the length of this period of highest protection. Though not in all cases the same, if a period is to be fixed, it might, we think, fairly be said to cover in general a period of nine or ten years.[1]

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[1] To make my meaning quite clear, let us assume that an inquiry was being held into the utility or otherwise of the practice of inoculation, and that the Commissioners were directed to inquire as to the effect of inoculation in reducing the prevalence of, and mortality from, smallpox. Would it have been any real answer to prove that inoculation had a protective influence upon the individual against natural smallpox? Obviously not; yet this is practically all the answer that the Commissioners vouchsafed to the same question as regards vaccination.

"(4) That after the lapse of the period of highest protective potency, the efficacy of vaccination to protect against attack rapidly diminishes, but that it is still considerable in the next quinquennium, and possibly never altogether ceases.

"(5) That its power to modify the character of the disease is also greatest in the period in which its power to protect from attack is greatest, but that its power thus to modify the disease does not diminish as rapidly as its protective influence against attacks, and its efficacy during the later periods of life to modify the disease is still very considerable.

"(6) That re-vaccination restores the protection which lapse of time has diminished, but the evidence shows that this protection again diminishes, and that to ensure the highest degree of protection which vaccination can give, the operation should be at intervals repeated.

"(7) That the beneficial effects of vaccination are most experienced by those in whose case it has been most thorough. We think it may be fairly concluded that where the vaccine matter is inserted in three or four places it is more effectual than when introduced into one or two places only—and that if the vaccination marks are of an area of half a square inch, they indicate a better state of protection than if their area be at all considerably below this."

Now, it is quite clear that *every one of the above seven findings has reference to the effect of vaccination upon the individual*, and I submit that though we may be quite prepared to subscribe to all these findings of the Majority Report, as I myself am (with the slight reservation already made as to the duration of the period of highest protective potency), *it is still quite an open question what the effect of vaccination is upon the community, i.e.* in reducing the prevalence of, and mortality from, smallpox.

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[1] As already stated, I think this period is too high, and that five years would be more correct.

Reference 2. As to what Means, other than Vaccination, can be Used for Diminishing the Prevalence of Smallpox; and how far such Means could be Relied on in Place of Vaccination

This reference is so important, and the finding of the Commission is so conclusive, that I am quoting from their Report at some length:—

"Another question upon which we are asked to report is, what means, other than vaccination, can be used for diminishing the prevalence of smallpox; and how far such means could be relied on in place of vaccination.

"The means other than the inoculation of smallpox or cowpox, which have been referred to by witnesses as being capable of diminishing the prevalence of smallpox, are such means as have been employed against infectious diseases generally; they may be summarised as: (1) Measures directed against infection, *e.g.* prompt notification, isolation of the infected, disinfection, etc. (2) Measures calculated to promote the public health, the prevention of overcrowding in dwellings or on areas, cleanliness, the removal of definite insanitary conditions, etc.

"The principle underlying the practice of isolation, with its accompanying machinery, is obviously the very opposite of that which recommended the practice of inoculation; it aims at exclusion of the disease, whereas inoculation aimed at universal acceptance by artificially 'sowing' or 'buying' the disease" (Sects. 451 and 452). (We may add that it is also the opposite of vaccination which aims at the universal sowing and re-sowing of another, but milder, disease.—C.K.M.)

". . . In 1784 Haygarth, of Chester, published his *Inquiry how to Prevent the Smallpox,* and in 1793 *A Sketch of a Plan to Exterminate the Smallpox from Great Britain.* . . .

"In the *Medico-Chirurgical Review* for 1796 there appeared an account of a work by Dr. Faust of Leipsic, entitled *An Essay on the Duty of Man to Separate Persons Infected with the Smallpox from those in Health, thereby to Effect the Extirpation of that Disease Equally from the Towns and Countries of Europe.* . . .

"In 1798 Jenner's *Inquiry* was published, and in the early years of this century inoculation began to be discouraged; for a while prospects of annihilating smallpox by vaccination appear to have superseded, in the minds of many, the plans of Haygarth and others. Some vaccinators, however, like Willan and Ring, still looked to methods of quarantine and to national and municipal regulations promoting isolation to exterminate the smallpox. . . .

" Prior to the year 1866 there was no provision made by law for enabling sanitary authorities to establish hospitals for infectious diseases, and thus to promote the isolation of such cases. The only institutions of that description then existing were the result of private effort. So far as regards smallpox there was, practically speaking, no provision for its treatment by means of isolation.

" The Sanitary Act of 1866 empowered, though it did not compel, local authorities throughout England and Wales, Scotland and Ireland, to provide or to join in providing, isolation hospitals for the use of the inhabitants of their districts. There was further legislation on the subject by the Public Health Act, 1875 ; the Public Health (London) Act, 1891 ; the Public Health (Scotland) Act, 1867 ; and the Public Health (Ireland) Act, 1878 ; into the details of which it is not necessary to enter. The most recent Act relating to the matter is the Isolation Hospitals Act of 1893, which applies to the small towns and rural districts of England and Wales (Sects. 456–461).

" In 1879, by the Poor Law Act of that year, power was given to the Metropolitan Asylums Board to contract with the local authorities for the reception into the Board's hospitals of any persons suffering from smallpox or other dangerous infectious disorder within their districts, but it was not until 1889 that express power was given to the Asylums Board by the Poor Law Act of that year to admit persons reasonably believed to be suffering from smallpox who were not paupers. . . ."

The Commissioners observe that in 1879 only about 18 per cent. of sanitary authorities had made any kind of provision for isolating cases of infectious disease, whilst as recently as 1892, when the Commissioners began their inquiry, the proportion was only 36 per cent. This shows how little prepared the country was at that time for dealing with smallpox by means of isolation of the disease. Vaccination, indeed, was at that time the only recognised preventive.

The Commissioners proceed :

"The value of isolation in restricting the spread of smallpox has been long acknowledged by the Medical Officers of the Local Government Board.

"Dr. (afterwards Sir George) Buchanan, in a report made in 1874, expressed the opinion that 'smallpox as well as other infections,' is capable of being wonderfully limited by isolation in hospital, and the amount of provision made for such isolation may be expected to affect materially the rate at which an epidemic of smallpox becomes extinguished. . . .

"Evidence bearing on the same point was given by Dr. Thorne before the Royal Commission which in 1881–2 inquired into the subject of smallpox and fever hospitals in London. Speaking of hospitals for infectious diseases generally, he said: 'The evidence is so abundant that I could occupy you for hours in telling you of instances in which epidemics have evidently been prevented by the isolation of first cases of infectious disease.' . . .

"Dr. Thorne says: 'It is really more striking as regards smallpox than any other disease, because smallpox can be more easily isolated; the friends of the patients, and they themselves, being so much more willing to submit to isolation than when suffering from any of the other specific fevers.'

"After the hospitals established by the Metropolitan Asylums Board had been employed for some time for the reception of persons suffering from smallpox, attention was called to the fact that the number of cases of the disease in the neighbourhood of the hospitals was apparently in excess of the number found in streets farther removed from them, and a suspicion was aroused that the hospitals themselves were causing a spread of the disease. . . .

"The matter was felt to be of so much importance that a Royal Commission was appointed to consider the prevention and control of epidemic infectious diseases in London and its neighbourhood.

"The Commission arrived at the conclusion that it 'appeared clearly established' by the experience of the five hospitals maintained by the Asylums Board for smallpox patients, that 'by some means or other the asylum hospitals in their present shape cause an increase of smallpox in their neighbourhoods.' . . ." (Sects. 465–470.)

In consequence, the Metropolitan Asylums Board decided to treat their smallpox cases in the hospital ships at Long Reach, and in 1881 in the hospital camp at Darenth (for convalescent cases), and to discontinue treating any patients in the Metropolis itself. All cases of smallpox were finally removed from the Metropolitan area in 1885.

"We have already directed attention to the fact that it was, practically speaking, not until 1871 that hospital accommodation was provided in London, which rendered possible the removal from their homes of persons suffering from smallpox, and we have detailed the measures adopted from time to time for that purpose.

"As these facilities were augmented, the proportion of cases treated in the Metropolitan Asylums Board's hospitals steadily increased.

"The Royal Commission to which we have referred, in their Report made in July 1882, contrasted the amount of smallpox in London with that which had occurred in England generally. It will be well to bring such a comparison down to the present time and to notice the features which it presents.

"The following table affords a comparison between the mortality in London and that in England and Wales, with the Metropolis excluded, the deaths being those from smallpox to every 100,000 living[1]:

	Mean Annual Deaths from Smallpox to every 100,000 living.	
	England and Wales, excluding London.	London.
1838–42	54·5	77·1
1847–56	23·6	34·6
1857–66	20·0	26·8
1867–76	22·5	41·9
1877–86	3·3	27·4"

(Sects. 491–492.)

In 1885, as already mentioned above, all cases of smallpox

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[1] The smallpox figures for the period since 1886, obtained from the Registrar-General's Reports, are as follows:

	England and Wales, including London.	London.
1887–1896	1·7	0·9
1897–1906	1·4	3·5

were removed outside the Metropolitan area, and since then smallpox mortality has fallen as remarkably in London as it had previously done in the provinces.

The above figures bring out clearly the great importance of other factors than the efficiency or otherwise of vaccination in conducing to a high smallpox mortality. London was as well vaccinated as the provinces, but suffered far more severely from smallpox, the reasons, no doubt, being the greater aggregation of population and the presence of the London smallpox hospitals in London.

The Commissioners proceed:

"We have no difficulty in answering the question, what means other than vaccination can be used for diminishing the prevalence of smallpox? We think that a complete system of notification of the disease, accompanied by an immediate hospital isolation of the persons attacked, together with a careful supervision, or, if possible, isolation for sixteen days of those who had been in immediate contact with them, could not but be of very high value in diminishing the prevalence of smallpox. It would be necessary, however, to bear constantly in mind as two conditions of success, first, that no considerable number of smallpox patients should ever be kept together in a hospital situate in a populous neighbourhood, and secondly, that the ambulance arrangements should be organised with scrupulous care. If these conditions were not fulfilled, the effect might be to neutralise or even do more than counteract the benefits otherwise flowing from a scheme of isolation.

"When we turn to the other branch of the inquiry, how far such means could be relied on in place of vaccination, we find ourselves involved in questions of a much more complicated nature. *We have little or no experience to fall back upon. The experiment has never been tried* (italics added).[1]

". . . Who can possibly say that if the disease once entered a town, the population of which was entirely or almost entirely unprotected, it would not spread with a rapidity of which we have in recent times had no experience, or who can foretell what call might then be made on hospital accommodation if all those attacked by the disease were to be isolated?" (The experience of Leicester shows that these fears are hardly warranted.—C.K.M.)

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[1] We shall see later, when we come to deal with Leicester, that the experiment has now been tried and found to be very successful.

"Even admitting fully the protective effect of vaccination, it does not, in our opinion, diminish the importance of measures of isolation or dispense with their necessity." [1] (Sects. 499–504.)

It is to be noted that all the above extracts are from the Majority Report, and I have quoted them to show what great importance the Commissioners attached to hospital isolation in the case of smallpox.

It should be observed that during the period prior to the Report of the Royal Commission, hospital isolation was only very imperfectly carried out, whilst in many towns it was not even attempted. The accommodation provided was generally quite inadequate, and often the hospital was so situated as to be a positive danger to the town it was supposed to serve. Moreover, those modern methods of hunting up and vaccinating contacts and of keeping them under surveillance, which have proved so valuable in recent epidemics, and which are essential in order to supplement hospital isolation, were then little understood or practised. We are justified in saying that undoubtedly hospital isolation had not been given a fair trial prior to the time of the Royal Commission; hence the natural hesitation of the Majority Commissioners to admit that isolation alone could be relied upon. We shall see presently, when we come to consider the experience of individual towns, that wherever an epidemic of smallpox got out of hand, as at Sheffield, Gloucester, Dewsbury, Warrington, or Middlesbrough, the method of prevention by hospital isolation had not been given a fair trial.[2]

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[1] This last statement of the R.C.V. should surely be a sufficient answer to those who try to make out that the necessity for smallpox hospitals, and therefore the cost of maintaining them, is due to the neglect of vaccination.

[2] We read very much the same story again and again: inadequate hospital accommodation quickly becoming overcrowded; the hospital administration breaking down; cases not promptly removed from their homes and spreading infection around them: the hospital itself improperly situated in a populous neighbourhood, and the overcrowded hospital becoming a centre for the dissemination of the disease; a medical officer of health hampered by private practice; the sanitary staff unequal to the enormous increase of work thrown upon them; the Local Authority honestly anxious to do its best, but inexperienced, undecided, fearful of incurring unusual expenditure, and helpless in the face of a sudden

Reference 3. *The Alleged Dangers of Vaccination.*—We shall deal with this consideration in a later chapter.

Reference 4. *Means for Preventing or Lessening the Ill-effects of Vaccination.*—The Commissioners strongly recommended the substitution of calf lymph for humanised lymph, which recommendation, as is well known, was shortly afterwards carried into effect, with the result that calf-lymph vaccination has now entirely superseded arm-to-arm vaccination. They also recommended the raising of the age-limit for infantile vaccination from three to six months, and this, too, has been carried into effect.

Reference 5. *The Question of Compulsion.*—As regards the important question of compulsion, the Commissioners recommended a modified and much less stringent form of compulsion by recognising and exempting the "Conscientious Objector" on certain conditions. Two of those who signed the Majority Report, however, dissented from this concession; but, on the other hand, two other Commissioners joined the Minority Commissioners in objecting to the retention of the principle of compulsion in any form. There were thus two in favour of unrelaxed compulsion; seven in favour of a greatly modified and reduced form of compulsion; and four in favour of compulsion being abandoned altogether. It would only have required the transfer of three votes, therefore, to have secured a majority in favour of the entire abolition of compulsion.

It may be observed that in an Interim Report, published early in the inquiry, the Commissioners had unanimously recommended the abolition of the harsh practice of inflicting repeated penalties for the same offence.

In conformity with the recommendations of the Commissioners, the Government passed the Vaccination Act of 1898, recognising and providing a means of escape for those "conscientiously" opposed to vaccination. It was hoped that this concession, by minimising prosecution and persecution, would greatly reduce the hostility to vaccination. Some even believed that

emergency; a Government Department which regards its proper function to be that of merely giving advice and pressing for returns, rather than of giving material help and assistance. With such conditions is it to be wondered at that the result should be panic and disaster?

We shall consider the remedy for this state of things later.

it would lead to an actually increased number of vaccinations; whilst others regarded it as a sign of weakness which would ultimately lead to a great decline in vaccination and a corresponding increase in smallpox. The event has proved that the latter view was right as regards the effect upon vaccination, but quite wrong (up to the present) as regards the effect upon smallpox.

The Minority Report

I think no one who has carefully studied it will deny that the statement of the two Dissentient Commissioners (Dr. W. J. Collins and the late Mr. J. A. Picton) of the grounds of their dissent from the Commissioners' Report constitutes a very valuable scientific document.

It is important to note, as already mentioned in the last chapter, that the Dissentient Commissioners did not attempt to deny the "temporary antagonism" between vaccinia and smallpox, testified to by Prof. Crookshank. Although, like the latter, they were undoubtedly hostile to vaccination, and therefore classed as anti-vaccinists, it must be admitted that there is a broad distinction—from the scientific point of view—between them and those anti-vaccinists who deny this "temporary antagonism," and describe the alleged protective influence of vaccination against smallpox as a "myth" and a "delusion."

The Dissentient Commissioners, as might be expected, drew special attention to the injuries to health caused by vaccination. As the practice of arm-to-arm vaccination was at that time still in force, they naturally emphasised the reality of the danger of vaccino-syphilis, and they quoted with approval the words of Sir Thomas Watson, who, alluding to this risk, had said: "I can readily sympathise with, and even applaud, a father who, with the presumed dread or misgiving in his mind, is willing to submit to multiplied judicial penalties rather than expose his child to the risk of an infection so ghastly."

They dealt at considerable length with the question of the means other than vaccination for diminishing the prevalence of smallpox, and laid special stress on the part played by sanitation. They said: "We are quite unable to agree with those who have maintained that sanitary measures have little or no influence upon smallpox. We have already given our reasons for thinking that the teaching of the early sanitarians, like Howard and Haygarth, towards the close of last century, initiated a new line of thought in the prevention of disease, and we believe the general improvement of the public health which then set in was due, in a large measure, to a greater sanitary activity, and that the falling off in the death rate of fevers and smallpox, as well as in the general death rate, is confirmatory of this view."

I shall refer again to this part of the Minority Report in the next chapter when contrasting vaccination and sanitation.

When considering the possibility of successfully combating smallpox epidemics by means of isolation, the Minority Commissioners refer to Sir James Simpson's views, enunciated by him in 1868 in a paper entitled "A Proposal to Stamp Out Smallpox and Other Contagious Diseases." Sir James Simpson's contention in brief was: "For all that appears necessary for the purpose is simply the methodic temporary seclusion, segregation or quarantine of those affected with smallpox until they have completely passed through the disease and lost the power of infecting and injuring others. The poleaxe was the chief and leading measure required to stamp out rinderpest. *Isolation is the chief and leading measure required to stamp out smallpox.*"

The Dissentient Commissioners made some very trenchant remarks in discussing the question of alterations in the law as to vaccination. They wrote:

"It is apparent from the history of legislation on this subject that the assumption underlying every amendment of the law was a strong and general belief that, if only the absolute universality of efficient primary vaccination could be secured, epidemics would be prevented, and practical immunity would be secured for the whole population throughout life. On the other hand we have it in evidence that the epidemic of 1871–3 was as severe and widespread as any experienced during this century, and that in the course of this epidemic 'a very large proportion of the total smallpox deaths of adults was amongst people who had at some time or other been vaccinated.' It would seem, therefore, that there is a certain amount of discrepancy at the present day between the theory on which the compulsory law is based and the actual state both of fact and opinion. Under these circumstances it has been suggested to us that the obvious remedy is to amend the law by making re-vaccination compulsory. But though such a course might receive a good deal of support from medical opinion, the evidence we have as to the condition of public feeling shows that it would be impracticable. This condition of things can hardly be considered satisfactory. The law as it stands enforces, under penalty of fine or imprisonment, a practice once thought to be an effectual preventive of epidemics and a practical safeguard for every individual vaccinated. But this prescription of the law is now generally recognised as insufficient unless primary vaccination be supplemented by secondary or repeated vaccination. The question thus arises whether it is just or expedient to enforce at the cost of much local discontent a preventive which does not secure the end proposed, and which confessedly cannot now be supplemented by the only measures which, according to the medical opinions quoted, could make it effective.

"It cannot be denied that the law as it stands is of a very exceptional character. It is the only instance under our Constitution of the universal enforcement by fine and imprisonment of a surgical operation. . . . In all other cases preventive sanitary law affects only outward circumstances. . . . In all such cases the social interests are so direct and predominant, and the individual claims affected are so slight or so purely mercenary . . . that the reasons for compulsion are simple and uncomplicated by any delicate question of personal rights. But compulsory vaccination goes beyond outward circumstances, and invades the integrity of the healthy body. It requires a wound, however slight, to be inflicted on every healthy infant born, and the contraction of a disease, however slight. . . . It may fairly be conceded that a compulsory law of this nature requires justification different both in kind and degree from that of laws affecting ordinary nuisances.

"The case as put before Parliament in 1853 seemed exceedingly strong. But, unfortunately, it did not receive much discussion. It rested, as we have seen, on the practical unanimity of the medical profession in the opinion that universal, primary vaccination would extinguish smallpox. It was argued that the plague of smallpox was such as to justify exceptional measures. . . . In 1853 there were few or no signs of opposition amongst the population when called upon to submit to the law. There was a general acquiescence in the assumption that the abatement of the virulence of smallpox from the commencement of the nineteenth century had been due almost entirely to the voluntary and partial adoption of vaccination. Those who neglected it were reasonably suspected of doing so from mere carelessness and indifference to the social welfare. It seemed right in the opinion of the time, therefore, that they should be compelled to adopt an apparently harmless precaution, which was believed only to need universal enforcement to secure the whole nation against a deadly disease. If these anticipations had been realised there seems no reason to doubt that the law would have continued to be enforced with little or no friction." (Sects. 276–289.)

In concluding their report, the Minority Commissioners wrote: "The whole principle of securing the protection of a community from smallpox by the artificial production of a mild disease (whether it be inoculation or vaccination) is based upon the thoroughness of the procedure in two directions: (1) in applying the inoculatory process to *every* individual, and (2) in securing to each individual operated upon the maximum of protection the process is capable of securing. The proposals of our colleagues (the Majority Commissioners) appear to us to fail upon their own showing in both directions. They recognise the impossibility of securing the primary vaccination of every person, and open a means of escape for objectors. They are also not prepared to recommend that re-vaccination should be pressed in the same manner as the primary operation at a time when the vaccinated have lapsed into susceptibility to smallpox. This serves to prove that any such system must at best be a broken reed on which to rely for the protection of a community from smallpox epidemics. We believe the methods of isolation of the infected, disinfection, and the observance of strict cleanliness are both more effective and more legitimate methods for the State to encourage. They have the advantage of applying the preventive only where it is required; and they do not necessitate the performance of an operation upon the person of every healthy individual. We therefore recommend that the law be amended by the repeal of the compulsory clauses of the Vaccination Acts." (Sects. 298–391.)

The Minority Report was signed, as already mentioned, by Dr. (now Sir William) Collins and Mr. Allanson Picton. It may well be regarded as the complement of the Majority Report, each Report representing in a moderate and scientific spirit the point of view respectively of the pro-vaccinists and the anti-vaccinists. Both Reports should be studied in conjunction with each other. I would suggest that the Majority Report attaches undue importance to the part played by infantile vaccination as a protection to the community against smallpox, and is too pessimistic as to the efficacy of isolation, etc., as a substitute for vaccination. The Minority Report, on the other hand, fails to recognise the practical value of vaccination in protecting the individual temporarily, but rightly emphasises the important part played by "sanitation" in helping to banish smallpox from the community.

CHAPTER IV

THE RELATIVE IMPORTANCE OF VACCINATION AND SANITATION

Meaning of the Word "Sanitation": Includes Isolation, and Other Modern Measures—Definition of "Sanitation" given in Minority Report—Edwin Chadwick and Sanitation—The Experience of India—Experience of Japan—Experience of Great Britain—Examples of Good Vaccination but Bad Sanitation: (1) Middlesbrough; (2) Warrington; (3) Sheffield—Why not Vaccination *plus* Sanitation?

In this chapter it is proposed to consider the relative importance of vaccination and sanitation in protecting the community from smallpox. I say "community" advisedly, because I frankly admit that sanitation, except indirectly, has little or no effect in "protecting" the *individual*, in the sense of conferring personal immunity. Individuals exposed to the infection of virulent smallpox will readily contract the disease, no matter how "sanitary" the conditions under which they may be living. So far as the individual who is exposed to infection is concerned "sanitation" is indeed a "broken reed" on which to lean. It would be utterly useless, for example, as a protection for smallpox nurses.

But at the same time I believe firmly in the great importance of sanitation in protecting *the community*. It is the failure to distinguish between the individual and the community which has been the cause of so much confusion and difference of opinion on this question of the influence of sanitation, just as we saw was the case with the question of the influence of vaccination.

Before going further it will be well to define our terms. By "vaccination," as I am here using the word, I refer to infantile vaccination as established by law in this country. I do not refer to vaccination of smallpox staff, which is purely an administrative detail, nor to emergency vaccination. Nor do

I refer to a repeated system of vaccination and re-vaccination as practised in Germany. The mere fact that the complete German system is effective in reducing smallpox mortality to a minimum,[1] is no proof that our own incomplete system of infantile vaccination alone is of any real use, or that it may not even be productive of more harm than good. Moreover, if it should be found by experience that it is possible to obtain by sanitation alone results at least as good as those obtainable by a complete system of vaccination and re-vaccination, no impartial person can doubt as to which is the preferable and more ideal system.

As to our definition of the term "sanitation," I use this term in its very widest sense as including all those influences affecting the public health (other than infantile vaccination) over which a community has control. It therefore includes such essential measures as notification of disease, isolation, disinfection, surveillance of contacts, etc.[2]

In the Minority Report of the Royal Commission the term was used in a similar broad sense. The Dissentient Commissioners gave the following comprehensive definition:

"In speaking of sanitation we use the word in its widest sense; we are not speaking merely of drainage improvements, but we include the prevention of overcrowding on areas, or within houses and rooms, the proper construction of dwellings, so as to permit through ventilation, the promotion of cleanliness by adequate water supply and the prompt removal of filth accumulations. Related to these measures, but in a somewhat different category, are means directed against contagion, the speedy separation (in suitable hospitals) of the infected from the healthy, the disinfection of persons and things, and the prevention of the propagation of the disease by inadvertent carelessness or intentional inoculation." (Sect. 222.)

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[1] Although the deaths from smallpox in Germany have been reduced to a minimum, it must not be assumed that the attack-rate has been reduced to quite the same extent. In a re-vaccinated community there may be many cases, which though of a mild type and very rarely proving fatal, may yet be productive of much sickness and economic loss.

[2] Those who contend that "sanitation" is no safeguard against smallpox are apt to place a very narrow meaning upon the word, as though it only implied good drainage or an absence of filth nuisances. But those who rely on "sanitation" are quite entitled to use the word in its very widest sense. Nor is it unduly stretching the ordinary meaning of the term to make it include notification, isolation, and all modern measures for controlling disease. The definition of "sanitation" given in *Murray's English Dictionary* is, "The devising and application of means for the improvement of sanitary conditions," and the definition of "sanitary" is, "Of or pertaining to the conditions affecting health, especially with reference to cleanliness and precautions against infection."

The Minority Report also quotes with approval the opinion of the great sanitary reformer, Edwin Chadwick, who maintained "that cases of smallpox, of typhus, and of others of the ordinary epidemics, occur in the greatest proportion on common conditions of foul air from stagnant putrefaction, from bad house drainage, from sewers of deposit, from excrement-sodden sites, from filthy street surfaces, from impure water, and from overcrowding in private houses as well as in public institutions. . . . That the entire removal of such conditions by complete sanitation and improved dwellings is the effectual preventive of diseases of those species, and of ordinary as well as of extraordinary visitation."

As an illustration of the grossly insanitary conditions which prevailed in Chadwick's day I will quote the following extract from a report to the Poor Law Commissioners by Dr. Neil Arnott giving the results of an inspection he made in 1842 of the wynds of Glasgow in company with Mr. Chadwick and others.[1]

> "We entered a dirty low passage like a house door, which led from the street through the first house to a square court immediately behind, which court . . . was occupied entirely as a dung receptacle of the most disgusting kind. Beyond this court, the second passage led to a second square court, occupied in the same way by its dunghill; and from this court there was yet a third passage leading to a third court and third dungheap. There were no privies or drains there, and the dungheaps received all the filth which the swarm of wretched inhabitants could give; and we learned that a considerable part of the rent of the houses was paid by the produce of the dungheaps. Thus, worse off than wild animals, many of which withdraw to a distance and conceal their ordure, the dwellers of these courts have converted their shame into a kind of money by which their lodging was to be paid. The interiors of these houses and their inmates correspond with the exteriors."

Three years before, Dr. Cowan had written:

> "Many of the causes of the production and propagation of fever must be ascribed to the habits of our population; to the total want of cleanliness

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[1] Quoted from a paper, "Vaccination or Sanitation," by J. C. McVail, published in *Public Health*, May 1896.

> among the lower orders of the community ; to the absence of ventilation in the more densely peopled districts ; and to the accumulation, for weeks and months together, of filth of every description in our public and private dunghills ; to the overcrowded state of the lodging-house resorted to by the lowest classes ; and to many other circumstances unnecessary to mention."

In 1818, Dr. R. Graham had written :

> " If any man wonders at the prevalence of continued fever among the lower classes in Glasgow, or at its spreading from their habitations, let him take a walk which I did to-day with Mr. Angus, one of the district surgeons. Let him pick his steps among every species of disgusting filth, through a long alley from four to five feet wide, flanked by houses five floors high, with here and there an opening for a pool of water, from which there is no drain, and in which all the nuisances of the neighbourhood are deposited in endless succession, to float and putrefy and waste away in noxious gases. Let him look as he goes along into the cellars which open into this lane, and he will probably find lodged in alternate habitations, which are no way distinguished in their exterior, and very little by the furniture which is within them, pigs, cows, and human beings, which can scarcely be recognised till brought to the light or till the eyes of the visitant get accustomed to the smoke and gloom of the cellar in which they live."

In the light of such terribly insanitary conditions it is not surprising to learn that the mortality caused by zymotic diseases, and especially by smallpox, was extremely high. Out of every hundred deaths from all causes about nineteen were due to smallpox. But if insanitary conditions such as are described above conduce to a high mortality from smallpox, it is surely logical to argue that the removal of such insanitary conditions will tend to reduce smallpox mortality, though the extent to which it will do so can only be decided by actual experience.

In contending for the paramount part played by " sanitation " in protecting a community from smallpox I do not wish to suggest that sanitation has an equal effect upon all epidemic diseases or that it acts upon all in the same manner. The effect can only be judged by experience and not *a priori*. It will be generally admitted that sanitation has played a great part in the abolition of such diseases as cholera, plague, and typhus fever, and that it is playing a great part at the present day in abolishing enteric fever. It will also be agreed that hitherto it has had comparatively little effect upon such diseases as measles and whooping-cough. Its effect upon scarlet fever may be a matter of some doubt, but I think it is reasonable to claim the reduced severity of the disease as, to some extent, the result of sanitation.

As regards smallpox, I cannot help thinking that there would have been much more readiness to give credit to sanitation for the great reduction in mortality which has been such a striking phenomenon during the past forty years, had it not been for the fear that such an admission would have detracted from the credit of vaccination.

There are two reasons why the part played by sanitation in the prevention of smallpox has not hitherto been more fully recognised:

(*a*) The narrow and restricted sense in which the term " sanitation " has been often used, as meaning little more than improved drainage, etc.

(*b*) The tendency to consider the case of the individual rather than that of the community. As we have already pointed out, sanitation can have but little direct effect upon the individual.

I would suggest that " sanitation " protects the community in two different ways. (1) By reducing the virulence of the infection. The exact *modus operandi* of this must at present be largely a matter of speculation, but it seems to me as reasonable to believe that overcrowding, filth (both personal and municipal), poverty, a low standard of living, and insanitary conditions generally may " generate " a severe and malignant type of smallpox as it is commonly believed they do in the case of typhus fever. There can be little doubt that there is some foundation of truth for the popular belief that insanitary conditions such as I have referred to will " breed a fever."

(2) But " sanitation " may also protect the community by so reducing the opportunities for infection that the disease cannot reproduce itself and so dies out. If we reflect, we must admit that this is really the way in which sanitation is causing enteric fever to die out. The infection of enteric fever is spread very largely, as we know, by means of infected water, infected shellfish, etc. By abolishing the channels of infection, " sanitation " is preventing the disease.

Similarly, in the case of malaria. Sanitation, by destroying the channel of infection (mosquitoes), is preventing the disease. So also with plague. By destroying the channel of infection (rats), sanitation is preventing the disease. In certain other diseases we are still ignorant of the principal channels of infection, and in these cases it is not surprising that sanitation has not hitherto been very successful. But in the case of smallpox we are justified in saying that the principal channel of infection is direct personal infection.[1]

The Effect of Isolation in Smallpox and Other Diseases

We should expect then, *a priori*, in this disease that isolation would be very effective, and this is just what we find to be the case. I say, without fear of contradiction, that in no other epidemic disease met with in this country is isolation so effective as in smallpox. Indeed, it was the remarkable success which attended the isolation of smallpox in hospital (in spite of the faulty manner in which at first it was carried out) which established the reputation of isolation hospitals.[2] This is made quite clear by a perusal of the Report on "The Use and Influence of Hospitals for Infectious Diseases" published by the Local Government Board in 1882.

One reason why hospital isolation is so much more effective in the case of smallpox than with other diseases lies in the fact that smallpox is very little, if at all, infectious before the appearance of the eruption, which is so characteristic (in an unmodified attack) that it can scarcely be overlooked. Moreover, the onset of the attack is sudden and severe, so that before the eruption appears the patient almost always has to take to his bed. Experience shows that where the first case in a house is *promptly* removed to hospital, the danger to the other inmates is not very great. Moreover, even though other members of a household have already been infected, it is still possible to protect them by vaccination. This vaccination of "contacts" is undoubtedly very valuable, and adds considerably to the effectiveness of hospital isolation. With a disease like scarlet fever, on the other hand, it only too frequently happens that where there are other susceptible persons in a house they will contract the disease in spite of prompt removal of the first case to hospital. Again, in scarlet fever any benefit gained whilst the patient is in hospital is neutralised by the tendency of many scarlet-fever patients to remain infectious for long periods and to carry the infection (possibly of a specially virulent type) home with them. The " return case " has long been recognised as one of the weak points in hospital isolation of this disease. But in smallpox, " return cases " are practically unknown. Although the disease is so highly infectious, and the infection so active whilst it persists, it appears to retain its vitality, under ordinary conditions, only for a short period.

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[1] We may exclude for the moment the very important question of "aerial" infection.

[2] Personally, I believe that, in the case of scarlet fever, hospital isolation has been a failure, but it was the undoubted success of the measure in the case of smallpox that led to such sanguine hopes being entertained as to what its effect would be if extended to scarlet fever. See also an article by the writer on "The Influence of Hospital Isolation in Scarlet Fever," published in *Public Health*, April 1908.

Or let us consider the case of measles. The failure of notification and isolation to control measles is fully recognised, and this failure has sometimes been quoted as a reason why we should not trust to the same measures in the case of smallpox, which in certain respects resembles measles. But there is an all-important characteristic of measles which quite accounts for our failure to control it. In place of having the sudden and severe onset, which is such a help in the case of smallpox, the onset of measles is most insidious, so that it is difficult to say when it actually begins. Moreover, experience shows that the patient is highly infectious from the beginning and *before* the rash appears. In the meantime the patient is going about, attending school, etc., and spreading infection broadcast. In smallpox we only get a condition at all approaching this when we have to deal with the highly modified form of the disease met with in vaccinated subjects. In measles, therefore, hospital isolation is foredoomed to failure.

The Experience of India

The Minority Commissioners gave some remarkable quotations from official reports on India, emphasising the difficulty of controlling smallpox by vaccination without sanitation. In the Report on Sanitary Measures in India, 1879–80, (p. 142) it was stated :

" The vaccination returns throughout India show the same fact, that the number of vaccinations does not necessarily bear a ratio to the smallpox deaths. Smallpox in India is related to season and also to epidemic prevalence: it is not a disease, therefore, that can be controlled by vaccination in the sense that vaccination is a specific against it. As an endemic and epidemic disease it must be dealt with by sanitary measures, and if these are neglected, smallpox is certain to increase in epidemic times."

Again, in the Report of the Army Commission of the Punjab for 1879 (p. 186): "Vaccination in the Punjab, as elsewhere in India, has no power, apparently, over the course of an epidemic. It may modify it and diminish the number of fatal cases, but the whole Indian experience points in one direction, and this is that the severity of a smallpox epidemic is more closely connected with sanitary defects, which intensify the activity of other epidemic diseases than is usually imagined, and that to the general sanitary improvement of towns and villages must we look for the mitigation of smallpox as of cholera and fever."

They also quoted from the Report for the Central Provinces (p. 206): "The past comparative immunity of the population had been attributed to efficient vaccination, and the people had accepted this protection, but their confidence has been shaken by the reappearance of a severe form of this disease. . . ."

Also from the Report for 1884-5 (p. 203), referring to the Sanitary Measures of the North-West Provinces and Oudh, where it is noted: "The facts already stated show conclusively that the smallpox of 1884 was one of the most severe epidemics on record, and by far the most severe in these provinces since deaths were registered. We are thus brought face to face with the fact that, notwithstanding the existence of an active vaccination service, smallpox swept over the provinces just as if there had been none. No doubt attacks and deaths had been prevented by the service, but it is clear that it has been incompetent to deal with the disease in its epidemic form. . . . These remarks are not intended to call in question the utility of vaccination. But in the presence of the facts the question is a perfectly relevant one, namely, whether dependence can henceforth be placed on vaccination as a protection against a smallpox epidemic? The question of course answers itself. In ordinary years lives are no doubt saved. . . . But this and similar experience appears to show that the remedies . . . will have to be extended beyond vaccination, and will have to deal with epidemic causes affecting localities and their inhabitants. If sanitary work be neglected no more dependence against smallpox epidemics can be placed on vaccination than can be placed on quarantine against invasions of cholera. The true remedies lie elsewhere altogether." [1]

The Experience of Japan

Japan is a country in which for a number of years vaccination has been carried out very thoroughly. At the same time it is probable that, being a very "young" country so far as modern science is concerned, she has not yet had time to arrive at anything like the condition of sanitary efficiency obtaining in this country. The result is instructive. In spite of a very great deal of vaccination, smallpox is still able to cause extensive and very fatal epidemics.

An official bulletin has been recently issued by the Statistical Department of the Commonwealth of Australia [2] from which the following quotations are taken:

"Occurrences of Smallpox in Japan

"That smallpox may become epidemic not only when vaccination is restricted, but also in spite of vaccination, re-vaccination, and further 'extraordinary' vaccination, is shown by comparing statistics of England and Wales and Japan in Tables VIII. and IX. and VII. Compulsory vaccination was instituted in Japan in 1876, and was rigorously enforced throughout the country by Imperial Ordinance No. 34, issued in Nov. 1885. This requires vaccination every five to seven years. The last ordinance was repealed by that of April 14th, 1909, which requires that every child shall be vaccinated before the June of the year following its birth; if unsuccessful, vaccination must be effected before December of the following year. These provisions are said to be rigorously enforced. The following Table shows that Japan is still subject to well-marked smallpox epidemics. The table shows the varying percentage of deaths . . . the range being from 2 per cent. to 41½ per cent., and averaging 30 per cent."

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[1] At the same time, in order to prevent misunderstanding, I wish to make it quite clear that I consider that so long as "sanitation" remains in so backward a condition in India, and smallpox in consequence remains so prevalent, every one going to India will be well advised to protect himself against the disease by vaccination and re-vaccination.

[2] Appendix to Monthly Summary of Australian Statistics, Bulletin No. 18, June 1913: "Statistics of Smallpox and Vaccination in Australia and Other Countries." Published under the authority of the Minister for Home Affairs, by G. H. Knibbs, C.M.G., Commonwealth Statistician.

Tables are then given showing the number of successful vaccinations and the number of smallpox cases and deaths in recent years. From these it appears that during the fifteen years, 1895–1909, there were 19,000,000 first vaccinations, nearly 13,000,000 re-vaccinations, and 8,000,000 "extraordinary" vaccinations. This is exclusive of unsuccessful vaccinations. Yet, in spite of this great amount of vaccination, it appears that during the fifteen years, 1896–1910, there were 80,000 cases of smallpox and 23,000 deaths. The great majority of these cases occurred in two epidemics. The epidemic of 1896–7 accounted for 53,000 cases with 15,000 deaths, and that of 1907–8 for 19,000 cases with 6,000 deaths. The very high proportion of deaths is remarkable, but as regards the first epidemic it must be admitted that it occurred too soon after compulsory vaccination began to be enforced (1885) to require much explanation. The last epidemic, however, with its equally high case mortality, is certainly rather surprising, and must have been a great disappointment to the vaccination authorities.[1] However, if Japan continues her vaccinating campaign *long enough* and is able to carry it out *sufficiently thoroughly,* no doubt she will cease to have fatal smallpox epidemics, and will obtain results as good as those obtained in Germany by a similar method. Whether she is yet advanced enough in "sanitation" to safely abandon vaccination and trust to sanitation alone, I cannot say, as I know nothing of the conditions obtaining in Japan or of the behaviour of smallpox in that country. But I think it is at least probable that if she continues to make as rapid progress in sanitary science as she has made in other fields of Western knowledge, the time will come before long when she will be able to dispense with all this vaccination and re-vaccination, with its attendant dangers and injury to health, and trust rather to sanitation.

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[1] At the same time, I have little doubt that if the necessary information were available we should find that the great majority of the cases which proved fatal were in persons who were either unvaccinated or not revaccinated.

The Experience of the United Kingdom

I propose to illustrate the relative importance of vaccination and sanitation in the United Kingdom by quoting the experience of towns in which vaccination was efficiently carried out but "sanitation" was neglected. I shall take as examples of such towns:

1. Middlesbrough.
2. Warrington.
3. Sheffield.

All three of these towns have suffered from extensive and fatal epidemics in spite of their well-vaccinated condition. In later chapters we shall consider the experience of a comparatively un-vaccinated town (Leicester), where sanitation has been comparatively well attended to, and we shall find that, in spite of the neglect of vaccination, smallpox has caused but little mortality. We shall also consider the case of towns (Gloucester and Dewsbury) where both vaccination and sanitation have been neglected, and where the result was disastrous.

1. The Case of Middlesbrough

The Middlesbrough epidemic of 1897–8 was a very interesting one, and it was unfortunate that it occurred just too late to be of value to the Royal Commission.

Middlesbrough was a particularly well-vaccinated town. From a vaccination census which he caused to be taken, the Medical Officer of Health, Dr. Dingle, estimated the proportion of unvaccinated persons in the population to be only about 2 per cent. In other words, the Vaccination Acts had been carried out as effectively as we can ever expect them to be. The town had grown with extraordinary rapidity, the population in 1851 being only 7,000, whilst in 1897 it was 90,000. As often happens in such cases, its sanitary condition was most unsatisfactory, and the public health organisation far from adequate. Dr. Dingle[1] said that "Middlesbrough might without much fear of contradiction be termed the 'home of epidemics,' for during the past ten years it has gone through epidemics of nearly all the principal zymotic diseases. There had been very serious epidemics of infectious pneumonia, enteric fever, scarlet fever, and now of smallpox. How far these epidemics have been due to such local causes as damp, sewage-polluted ground, defects in construction of sewers, defects in excrement disposal, overcrowding, and the dirty habits of a portion of the inhabitants, I am not in a position to say; but from recent experience I have found an utter carelessness on the part of the working classes to protect themselves against infection, or to adopt the most elementary rules of sanitation, such as cleanliness or fresh air."

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[1] In a paper published in *Public Health*, December 1898.

As regards preparedness for dealing with smallpox apart from the vaccinal condition of the population, we are told that Middlesbrough had no separate smallpox hospital, but at the general infectious-diseases hospital a small block containing 14 beds was set aside for smallpox, this block being only 10 or 15 yards away from the main building. Even by emptying the whole hospital and using it for smallpox alone, as was done when the epidemic occurred, accommodation could only be provided to the extent of 60 beds. The epidemic began early in 1897, and by February 6th the 60 beds became exhausted. It was not until March 3rd that there was sufficient accommodation to isolate all the cases, and in the meanwhile only the worst cases as regards surroundings were removed, about 129 cases being left to be dealt with at home. The work of erecting new buildings was pushed on day and night, and eventually provision was made for no less than 822 beds! Altogether the epidemic gave rise to 1,411 cases, and as proving—if proof be needed—that it was not the neglect of infantile vaccination which was responsible for this serious epidemic, I may mention that no less than 1,213 of these cases, or 86 per cent., had been vaccinated. Yet if Middlesbrough had happened to be a badly vaccinated town, like Gloucester or Dewsbury, it is probable that the neglect of vaccination would have been regarded as the cause of the epidemic.

As a matter of fact, much the same influences were at work in all these towns, especially the inadequate hospital accommodation, spread of the disease from the hospital, inability to isolate all the cases, and finally a complete breakdown in isolation. In each case resort had to be made ultimately to general vaccination of the population, and this, no doubt, largely conduced to arresting the epidemic. Fortunately there is always this measure to fall back upon if an epidemic really gets out of hand, but it should be regarded as evidence of failure, and with proper care and management it should very rarely, if ever, be called for.

Of course, where an epidemic is allowed to become an unchecked " conflagration," as was for a time the case at Middlesbrough, the mortality will be greater in proportion to the number of un-vaccinated persons in the population.[1] But as showing how futile infantile vaccination alone is to prevent death from smallpox we have the fact that in well-vaccinated Middlesbrough no less than 108 vaccinated persons lost their lives in this one epidemic! Against this we can set the fact that in un-vaccinated Leicester, with more than double the population, the total number of deaths, amongst both vaccinated and un-vaccinated persons, during the past 40 years (*i.e.* since the dawn of the sanitary era) has only been 69! Even if we compare cases only, ignoring the deaths, we find that in Middlesbrough in this single epidemic there were 1,213 cases in vaccinated persons alone, whilst in Leicester in 40 years there have been only 1,227 cases, including both vaccinated and un-vaccinated! One has to admit that, after all, there may be something in the anti-vaccinists' contention that it is better to rely upon efficient "sanitation" than upon infantile vaccination.

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[1] It is probably an erroneous, though common, assumption to suppose that if all the patients in an epidemic were unvaccinated, the same high fatality rate would occur which has been so often observed amongst the unvaccinated class in epidemics in which the great majority of the patients are vaccinated. It is almost invariably the case that there is a very great difference between the fatality of smallpox in the once-vaccinated and the unvaccinated classes, and this fact has repeatedly been urged as demonstrating the great advantage of infantile vaccination. It constitutes, indeed, one of the " stock " pro-vaccinist arguments.

I am doubtful whether the argument is quite so convincing as is generally supposed. I will set aside for the present the question, to be discussed later, whether it might not be easier under modern conditions to control a smallpox epidemic in a population entirely unvaccinated, and will assume that the same number of cases would occur. I suggest then that it is not safe to assume that the same high fatality (case mortality) would obtain as is so often found when only a very small proportion of the total cases occurring are unvaccinated. In such epidemics it is not unusual for the unvaccinated to show a case mortality of 30 to 50 per cent.

Thus in the Sheffield epidemic, 1887–8, the unvaccinated fatality was 49·6 per cent.; in the Warrington epidemic, 1892, it was 35·3; in the Middlesbrough epidemic, 1897–8, it was 47·4. It is difficult to believe that in pre-vaccination times such terribly high fatality rates frequently occurred, otherwise the mortality from smallpox would have been much higher than it was in view of the prevalence of the disease. It is not easy to explain these high fatalities in the small unvaccinated remnant, but no doubt there is something in the anti-vaccinist contention that the unvaccinated residue in a vaccinated community are as a class physically inferior to the vaccinated portion of the population.

2. The Case of Warrington

Warrington was one of the towns which suffered severely from smallpox in 1892–3, when the disease was prevalent throughout the country, and the epidemic of those years was specially reported upon by Dr. Savill for the Royal Commission. In a population of 54,000 persons 667 cases occurred, of which 62 proved fatal. Ten years later the Medical Officer of Health, Dr. J. G. Gornall, in his Annual Report for 1903, referring to smallpox, remarks: "Warrington is now in a peculiarly favourable position with regard to smallpox; having on the one hand a hospital two miles outside the town, in a sparsely populated district, *and on the other hand a well-vaccinated population*" (italics added).

I cannot help observing that this suggestion that Warrington is now in a peculiarly favourable position *because* it has a well-vaccinated population seems rather strange, and, to say the least, uncalled for. The uninitiated might reasonably conclude that at the time of the serious epidemic referred to, the vaccinal condition of the town was at fault. But any one familiar with the report of the Royal Commission on Vaccination will know that Warrington, like Middlesbrough, was one of the well-vaccinated towns of the country. The proportion of persons who had been vaccinated was unusually high. Dr. Savill found that the Vaccination Acts had been so thoroughly carried out at Warrington, prior to the epidemic, that no less than 99·2 per cent. of the population, according to his census, were vaccinated.[1]

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[1] Dr. Savill writes: "Turning to the subject of Primary Vaccination, it might perhaps, at first sight, be a matter of surprise that a comparatively well-vaccinated town like Warrington should have been the scene of such a severe epidemic of smallpox. I estimated that nearly 99·2 per cent. of the inhabitants had been vaccinated once in their lives before the outbreak" (Final Report, R.C.V., Appendix V., p. 5).

On the other hand, he says: "It will be gathered from the foregoing narrative that insufficient or imperfect isolation was an extremely important factor. . . . This was owing, in some instances, at the commencement, to a non-recognition of certain cases by a doctor's assistant,[1] but it was also due in a much larger degree to an absence of ordinary hospital accommodation for the reception and isolation of the patients as soon as they were attacked and identified. The sanitary authority had neglected to act on the recommendation of their Medical Officer of Health in this matter of hospital provision. . . . *It is rendered evident by a close examination of the facts of the epidemic that if the town of Warrington had possessed adequate hospital accommodation for infectious diseases, the epidemic would probably have never reached the dimensions it did, and the disease would in all probability have been limited to a few cases in certain quarters of the town*" (italics added).

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[1] Dr. Savill also writes: "As regards *the immediate causes which led to this outbreak*, the evidence seems to show that the three leading factors in the causation of the Warrington epidemic, 1892–3, were as follows:

1. "*Non-recognition* of three of the earlier cases, viz. the 2nd, 3rd, and 4th persons who developed the smallpox eruption in August. They were seen by a doctor's assistant (alleged to be qualified) acting in the absence of his principal. Two of them, though apparently well-marked types of smallpox, were treated at home by him as 'German measles' for ten and seven days respectively; meanwhile the visits of friends and neighbours were unrestricted; and their relatives went to work as usual, or played daily with other children in the adjacent streets or open spaces back and front of the house in that row. Finally the Medical Officer of Health, hearing rumours of these cases, visited them, and they were promptly removed to hospital, where one of them, the un-vaccinated child, æt. 10, died three days later. Three of the children of the older case contracted the disease, and altogether twenty-three cases resulted in their immediate neighbourhood . . . The third unrecognised case was a mild one, and altogether escaped detection and isolation. This man gave the disease to his wife and an indefinite number of other persons."

2. "*Deficient hospital accommodation* for the isolation of smallpox and other infectious diseases. Sixty-four beds represent the minimum requirements of the Borough of Warrington based on the number of cases of infectious diseases needing isolation which have actually arisen and were notified in the community during the four years 1889–1892; and the total provision at the commencement of the epidemic was thirty beds for all diseases, or less than half the very lowest estimate. . . . As a consequence of this only thirteen cases of smallpox could be received into the Borough Fever Hospital by dangerously overcrowding every available space. The cases therefore, about sixty in number, which arose between August 25th and September 19th, when additional temporary hospital provision was made, were of necessity left in their own homes scattered over the town. Consequently the town became so saturated with infection, and the cases arose so rapidly that the limit of hospital accommodation, even with the additional 159 beds crowded into the temporary hospital, was, for a second time, reached early in November, and large numbers again had to be left in their homes."

3. "*Deficiency of re-vaccination* among the inhabitants before this outbreak. My inquiries in a typical district . . . revealed the fact that only 2·7 per cent. of the inhabitants had been re-vaccinated prior to the epidemic. . . ."

(In view of the fact that there is not a town in the whole country of which it could not be equally said that re-vaccination was deficient, this last-mentioned "cause" seems rather far-fetched.—C. K. M.)

As a matter of fact, at the commencement of the epidemic the total provision for the hospital isolation of *all* infectious diseases was only thirty beds, and as a consequence of this we are told that "only thirteen cases of smallpox could be received into the Borough Fever Hospital, by dangerously overcrowding every available space."

Moreover, the hospital was situated in a rather thickly populated part of the town. In May, 1892, the Medical Officer of Health had reported that "there was very great danger in treating smallpox in close proximity to a populous neighbourhood . . . and two full wards of scarlet fever in our own grounds."

Owing to deficient hospital accommodation, 91 cases were left at home, either altogether or for periods varying from 2 to 22 days after the appearance of the rash. *Dr. Savill traced* 410 *cases to lack of hospital accommodation at the time these cases had to be left at home.* As regards the influence of the crowded hospitals (other hospitals were opened as the epidemic advanced) upon the surrounding neighbourhood, Dr. Gornall states: "I do not think there can be any doubt that these places (the hospitals) have been centres of infection to the surrounding populations." [1]

Under all these circumstances I think we can agree with Dr. Savill that "*it is not to be wondered at that on this account the smallpox epidemic of* 1892–3 reached the alarming proportions which it did."

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[1] Dr. Savill also wrote: "A larger number of cases arose, at first, in the neighbourhood of the Old Borough Fever Hospital when smallpox cases were there admitted. Subsequently, a temporary smallpox Hospital was provided in the northern part of the town, and then an undue proportion of houses became infected in its neighbourhood."

3. The Case of Sheffield

Sheffield was another town in which vaccination had been well carried out, but in which "sanitation"—so far at least as notification and isolation were concerned—had been neglected. The following is taken from the Final Report of the R.C.V. (Sect. 487):

"At Sheffield, during the epidemic of 1887–8, there was no compulsory notification, though a voluntary system of notification by medical men had been in vogue since 1885. *Only one-fourth of the thirty-two cases of smallpox known to have occurred during the first three months of the epidemic were thus notified.* Though the proportion of notified cases increased as the epidemic progressed, it is evident that during the most important period the system must be regarded as having failed. The borough hospital in Winter Street, which for a considerable period was the only hospital in use, did not provide adequate accommodation for patients, and became overcrowded; *moreover, being in proximity to a densely populated area, it became the means of spreading the disease.* Cases of smallpox were accordingly treated in buildings or huts in connection with the Sheffield and Eccleshall Unions' Workhouses, and the disease spread to inmates of the workhouses. Nevertheless, evidence is forthcoming from Sheffield of the great advantage to individual households of early removal of first cases. Dr. Barry says:

"'The advantages arising to individual households from the early removal of smallpox cases to hospital were clearly seen in the earlier months of the epidemic. From its commencement to the middle of July, during which period, with comparatively few exceptions, all cases of smallpox which came to the knowledge of the Health Department were at once removed to hospital, it was exceptional to have a recurrence of the disease in the same household. After the middle of July, in consequence of the inefficiency of hospital accommodation, a large and increasing proportion of smallpox cases had to be treated in their own homes, and multiple cases in families became of frequent occurrence. . . .'"

"The experience gained in 1887–8 has borne fruit; in 1889 Sheffield adopted the Compulsory Notification Act, and when smallpox broke out there in 1892–3 all cases were promptly removed to the new hospital at Lodge Moor, four miles from the centre of the town and in an isolated position. So convinced is the medical officer of the need for isolating those attacked that he is in favour of insisting on removal in any case.

"*Sheffield had obeyed the Vaccination laws better even than the average of large towns.* Had there been prompt removal of first cases to adequate and suitable hospital accommodation in 1887, it is in the highest degree improbable that the disease would have run riot as it did. It is important to notice that the rapid spread of the disease at the commencement of the epidemic in 1887–8 seems to have been due to the fact that some of the early cases were of so mild a character that they passed unobserved." (Italics have been added.)

We may well contrast with the above the statement made by the Medical Officer of Health for Sheffield seven years later. In his Annual Report for 1903 (p. 26), he writes: "During the whole of the year 1903 Sheffield continued to suffer from importations of the disease from outside districts, and in none of these instances did the disease spread. *Indeed, with our means of dealing with this infection—re-vaccination, isolation, and general supervision—it has come to be regarded by the staff as the infectious disease which is of all others the most satisfactory to deal with, as by vigilance and the proper use of the means at our disposal it is not a difficult matter, in the majority of instances, to prevent its spread*" (italics added).

Vaccination plus Sanitation

It may reasonably be urged that whilst the facts we have been considering above make it evident that infantile vaccination as provided by law is inadequate, without "sanitation," to safeguard a community against smallpox, they constitute no argument against the principle of trusting to infantile vaccination *plus* sanitation. If we believe in both "sanitation" and vaccination separately, why not combine the two, and so, presumably, obtain the advantage of both?

Whilst at first sight such a proposition seems plausible, there are certain considerations which put a different complexion upon it.

(1) If it can be shown that "sanitation," thoroughly carried

out, is alone sufficient for the effective control of smallpox in this country, why inflict upon the community universal vaccination with all its inseparable drawbacks ? Moreover, what justification can there be any longer for compulsion ?

(2) It has to be considered whether infantile vaccination—and especially the present incomplete system of infantile vaccination under which a large proportion of the community remain un-vaccinated—may not be an actual hindrance to "sanitation" ? In the next two chapters I shall adduce evidence to show that infantile vaccination in mitigating smallpox also masks it, and thereby positively tends to encourage the spread of infection. Assuming for the moment that this is the case, the suggestion that infantile vaccination may be a hindrance to "sanitation" is obviously quite a reasonable one.

CHAPTER V

THE TENDENCY OF VACCINATION TO SPREAD SMALLPOX BY MASKING THE DISEASE

This Aspect of the Question hitherto Overlooked—In Mitigating Smallpox Vaccination also Masks the Disease—Apparent "Mildness" of Smallpox Modified by Vaccination is not Transmitted (being an Acquired Character)—Authoritative Opinions as to the Rôle of the Unrecognised Case: J. Niven; A. K. Chalmers; G. F. McCleary; W. E. Armstrong; Ernest Hart—Frank Admissions: P. Boobbyer; Ricketts and Byles; J. H. C. Dalton—Unrecognised Cases in the Unvaccinated—Experience of Individual Towns—Leicester.

I NOW propose to consider somewhat fully an aspect of the vaccination question which, hitherto, has received but little attention. I refer to the tendency of vaccination to spread smallpox through its effect in modifying and at the same time *masking* the disease.

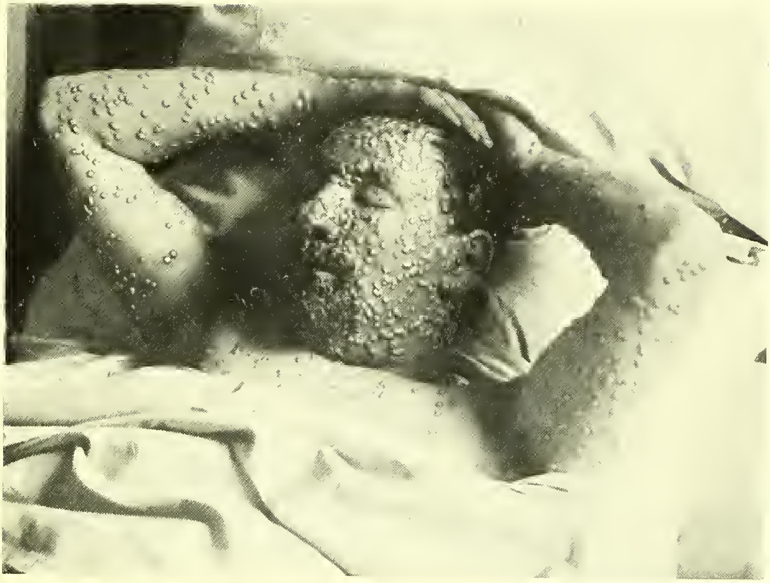
This tendency, though no doubt always existent, only attained its present importance since notification, isolation, and other modern measures came into active operation. Probably this accounts for the otherwise surprising fact that this aspect of the question was entirely ignored by the Royal Commission, so far at least as the Majority Report was concerned; and it was only casually referred to in the Minority Report.

Another reason why so little has hitherto been heard about this serious drawback to the practice of infantile vaccination is that anti-vaccinists, by a strange irony, are debarred from making use of this argument against vaccination! This is owing to the fact that the use of it involves the admission that vaccination does indeed modify smallpox, which hitherto they have strenuously denied.

Any one familiar with the history of smallpox in recent years is aware how frequently outbreaks arise through unrecognised cases of the disease occurring in persons who had been vaccinated many years ago. Such cases are often of a very trivial character, so far at least as the actual illness is concerned. The person attacked is only slightly ill and quickly recovers, whilst the eruption—so characteristic in persons who have never been vaccinated—is very sparse and highly modified. So much is this the case that the diagnosis of smallpox becomes extremely difficult, especially for those who have not had much experience of the disease. It is well known that the great majority of the mistakes in diagnosis made by medical men in connection with smallpox occur with this type of case. The disease may easily be mistaken for chickenpox, impetigo, acne, scabies, "pimples," rupia, etc. Moreover, since the constitutional symptoms quickly disappear as soon as the "spots" come out, it not infrequently happens that the patient thinks it unnecessary to consult a doctor, and returns to work after a few days at home. It may be observed that in the case of un-vaccinated patients it is extremely rare for no doctor to be called in, and with the greater facilities arising as a consequence of the National Insurance Act it will become still more rare in the future.

I have said that these cases are trivial in character. This is true so far as the particular individual attacked is concerned, but from the point of view of the community they are highly dangerous. Owing to the cases not being reported to the authorities, no precautions are taken, and it is only at the end of a fortnight or three weeks, when further cases develop from them, that the mischief is discovered. It may be too late then to prevent a serious outbreak. Moreover, although the cases appear to be of such a very mild type, they are not *naturally* mild. The mildness is only an "acquired" characteristic, due to the individual having been vaccinated. Consequently the mildness is not transmitted. It has often been noted that these cases do not "breed true," and if the infection happens to be given to an unprotected person—either one who has never been vaccinated, or one in whom the protection conferred by vaccination has entirely worn out—it frequently causes a very severe and possibly fatal attack.

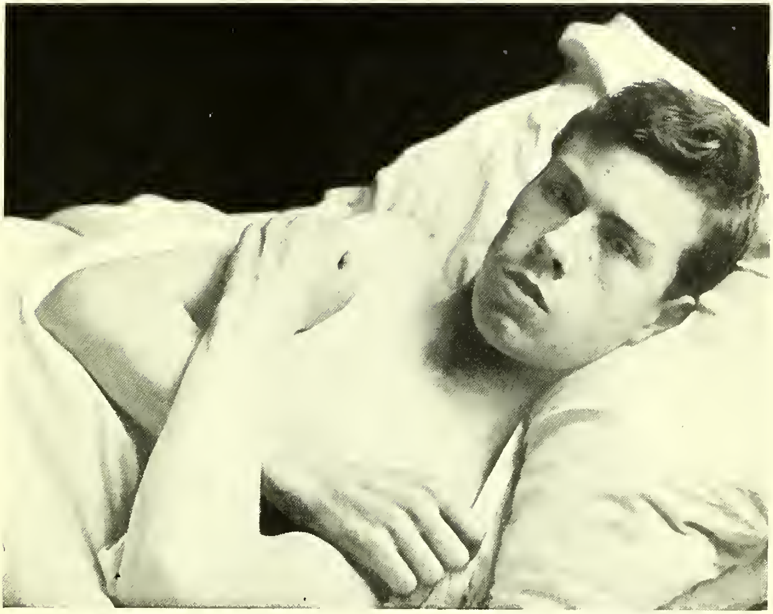
It is true that these mild unrecognised cases are probably not so infectious, *other things being equal*, as severe unmodified cases, but other things are not equal. Severe cases which are promptly recognised and at once removed to hospital, as is always the



(*Photo by the Author.*)

UNMODIFIED SMALLPOX.

Unmodified smallpox occurring in an un-vaccinated man, aged 30. This type of smallpox is highly characteristic and is usually very easy to diagnose.

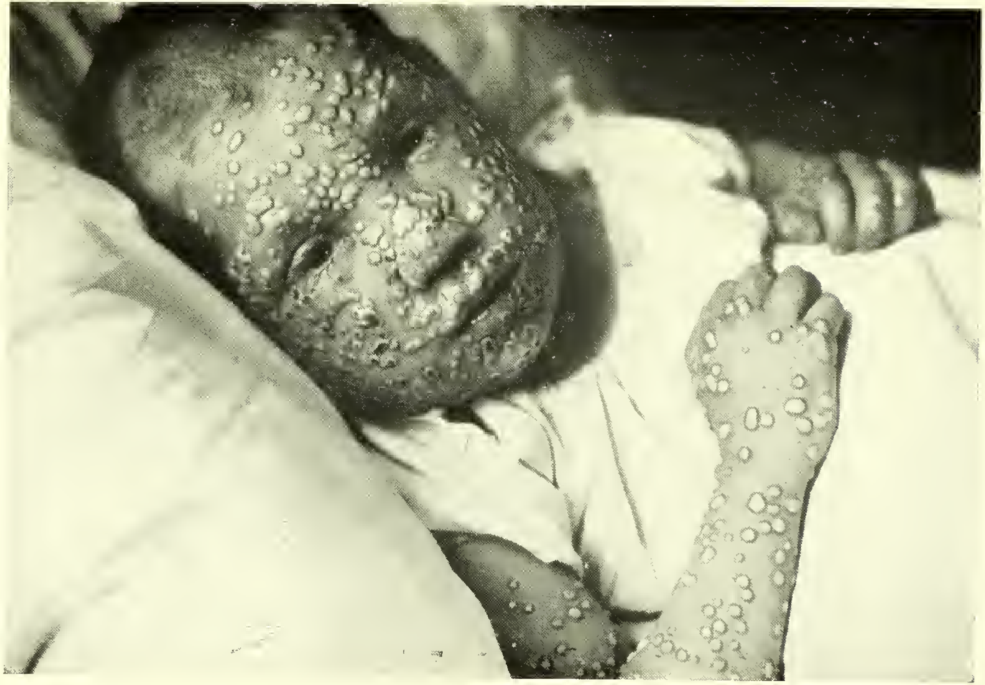


(*Photo by the Author.*)

SMALLPOX MODIFIED BY VACCINATION.

Smallpox in a vaccinated youth, aged 17. This type of smallpox is very indefinite and easily escapes recognition. Disastrous spread of the disease in a fatal form has often been traced to such "mild" cases.

PLATE IV

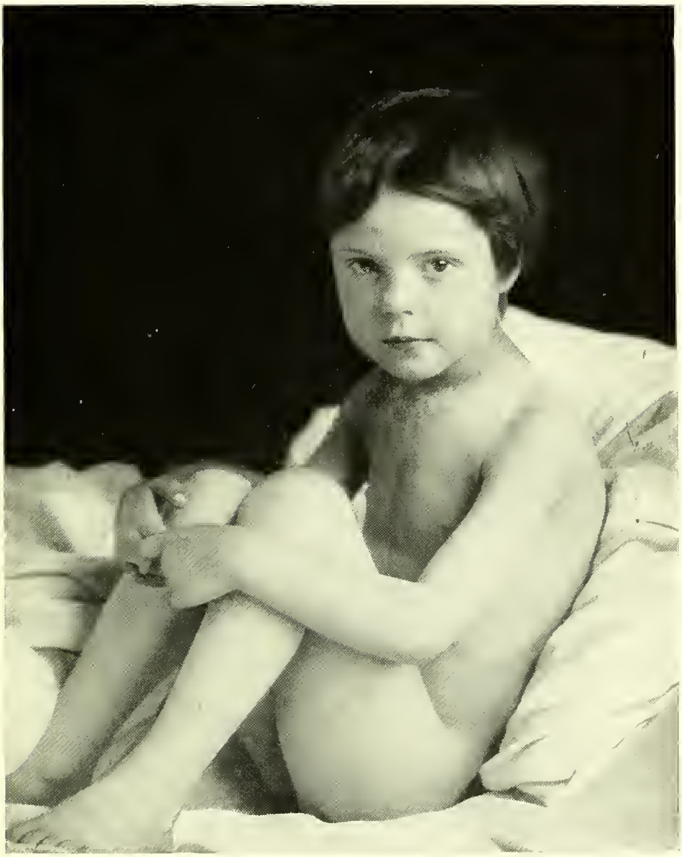


(*Photo by the Author.*)

SMALLPOX IN AN UN-VACCINATED CHILD.

Unmodified smallpox in an un-vaccinated child, aged 6. Such a case could not go about or attend school without the disease being recognised. Hence such cases are not very dangerous to other persons.

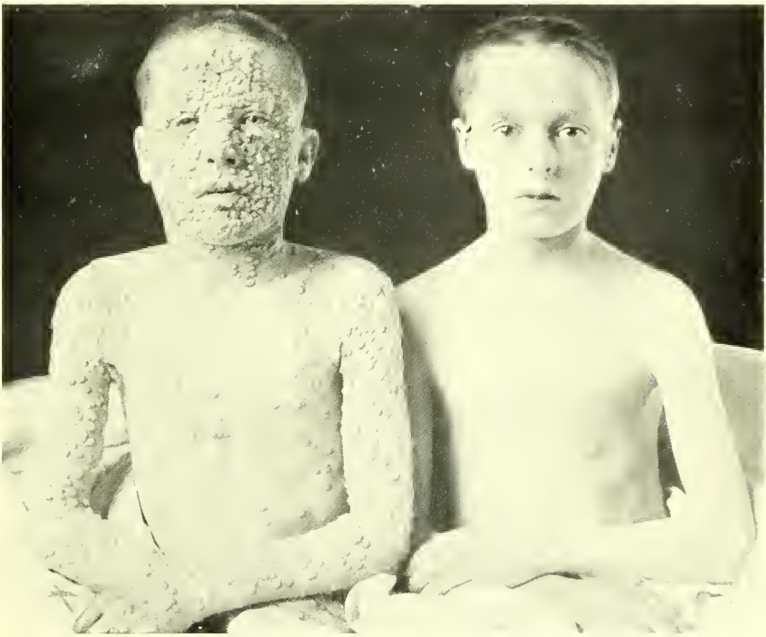
PLATE V



(*Photo by the Author.*)

SMALLPOX IN A VACCINATED CHILD.

Smallpox in a vaccinated child, aged 5. In this case there were only about half a dozen "spots" and the child was never really ill. Such a case might easily go about and attend school without the true nature of the disease being recognised, in which event a serious outbreak might result. These cases are highly dangerous to other persons.



(*Photo by Allan Warner, M.D., D.P.H.*)

WHICH IS THE GREATER DANGER TO THE COMMUNITY ?

Two lads, each aged 16, infected from the same source, on the same day. One was vaccinated, the other un-vaccinated. The latter had a well-marked attack which could not fail to be recognised. The former—the vaccinated case—had such a " mild and trifling " attack that it might easily have escaped recognition and in consequence have been the cause of a serious outbreak.

practice now, have no opportunities for spreading infection however infectious they may be, whilst these unrecognised cases, though admittedly less infectious, often have unlimited opportunities for spreading infection broadcast.[1] I shall show presently that this is what frequently happens. It would seem, indeed, that vaccination, by its very success in mitigating smallpox, largely defeats what is now our principal object, viz. that of preventing the spread of the disease.[2]

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[1] It has long been realised that it is the unrecognised rather than the recognised cases in an epidemic which are the greater danger so far as spreading infection is concerned. Defoe pointedly emphasised the fact in his *Journal of the Plague Year*, written nearly 200 years ago. He wrote:

" Here also I ought to leave a further remark for the use of posterity, concerning the manner of people's infecting one another; namely, that it was not the sick people only from whom the plague was immediately received by others that were sound, but the well. To explain myself, by the sick people I mean those who were known to be sick, had taken their beds, had been under cure, or had swellings or tumours upon them, and the like; these everybody could beware of; they were either in their beds or in such condition as could not be concealed.

" By the well I mean such as had received the contagion, and had it really upon them, or in their blood, yet did not show the consequences of it in their countenances; nay, even were not sensible of it themselves. . . . These breathed death in every place, and upon everybody who came near them; nay their very clothes retained the infection, their hands would infect the things they touched. . . .

" Now it was impossible to know these people, nor did they sometimes, as I have said, know themselves to be infected. . . . These were the dangerous people of whom the well people ought to have been afraid; but then, on the other side, it was impossible to know them.

" And this is the reason why it is impossible in a visitation to prevent the spreading of the plague by the utmost human vigilance, viz. that it is impossible to know the infected people from the sound, or that the infected people should perfectly know themselves " (*Everyman's Library Edition*, p. 219).

It may be observed in reference to the above that fortunately in the case of smallpox the disease, in the vast majority of cases, is very easily recognised. In no other infectious disease are the " tokens," as Defoe calls them—*i.e.* the outward manifestations—of the disease so characteristic and easily discerned. This, however, is only true so far as smallpox unmodified by vaccination is concerned. When we come to deal with post-vaccinal smallpox the disease is often so highly modified that its recognition, in place of being easy, becomes extremely difficult, and the patients themselves, although perhaps highly infectious, may not even know that they are ill.

[2] Illustrations of modified and un-modified smallpox occurring in vaccinated and un-vaccinated subjects are shown in Plates II—VI

We will now see how far the testimony of others supports this contention.

The great importance of the rôle played by the "missed" or unrecognised case of smallpox at the present day is fully recognised. Almost every smallpox report refers to it and affords striking examples.

A few authoritative opinions may be quoted:

Dr. J. Niven, M.O.H. for Manchester: "It is not too much to say that by far the most important factor in the spread of smallpox in Manchester has been the overlooking of cases. . . ." (*Health Report*, 1902.)

"The overlooking of mild cases was the chief cause of the spread of the disease. . . . The attack as a rule was so mild that no medical advice was sought, or, as happened in not a few instances, was not recognised as smallpox by the medical attendant. In fact this matter is of so much importance that it is not too much to say that if there had been no case overlooked, there would have been practically no smallpox outbreak in Manchester" (*Health Report*, 1903).

Dr. A. K. Chalmers, M.O.H. for Glasgow: "As in past outbreaks, we are again finding that one of the greatest obstacles to effectively coping with the disease is the occurrence of an extremely mild and modified form, which escapes recognition until, as a result, secondary cases of a graver nature arise" (*Smallpox Report*, 1900–2).

Dr. G. F. McCleary, formerly M.O.H. for Battersea (now Medical Adviser to the National Health Insurance Commission, England): "The spread of the disease was very largely due to unrecognised or concealed cases. This is the usual experience, and constitutes the chief difficulty in dealing with an outbreak of smallpox. In some cases the disease was of so mild a type that the patient thought he had merely caught a 'heavy cold' and, not troubling to see a doctor, went about his work after a few days at home, as if nothing had happened" (*Annual Report for Battersea*, 1902, p. 77).

Dr. W. E. Armstrong, late M.O.H. for Newcastle-on-Tyne: "With respect to the more positive means by which the spread of smallpox has been favoured, probably the failure to recognise the disease in its mildest forms is entitled to first place. A large number of localised outbreaks have been traced back to such mild unsuspected cases, where persons affected had for weeks been going about in a highly infectious state" (*Smallpox Report*, 1903–5).

Having established, I think, the great danger of unrecognised cases, I will proceed to show that these usually occur in persons who have been vaccinated, *and because they have been vaccinated.*

It should hardly be necessary to insist upon the effect of vaccination in modifying smallpox after its power to protect against attack has worn out. The "mitigating" effect of vaccination has been constantly insisted upon as one of its (supposed) great advantages.

Thus, the late Mr. Ernest Hart, editor of *The British Medical Journal*, and a recognised authority on vaccination, wrote[1]: "But it should be borne in mind that in those cases in which smallpox occurs after vaccination the disease is, almost without exception,[2] so far modified that its identity in its earliest stages is frequently unrecognised. . . . In Blackburn, the Medical Officer of Health met with a number of cases of smallpox in vaccinated persons where the disease was so far modified that the patients went about their work without being aware of the nature of the illness that was upon them."

The Medical Officer of Health for Carlisle, in his *Annual Report* for 1903 (p. 27), writes: "A very remarkable and important feature of the outbreak was the extreme mildness of many of the cases. In several instances the disease was so little marked as to escape recognition until a late period of convalescence, when, as a result of an examination of all the inmates of the infected houses, the cases were detected. *Such cases were invariably associated with efficient vaccination* in the person in whom they occurred, thus bearing impressive evidence of the power of vaccination in mitigating the severity of smallpox. The modified character of many of the cases *increased the difficulty in dealing with the outbreak*, inasmuch as many of the patients had freely mixed with people for the greater part of a week before the cases came under observation" (italics added).

Moreover, it has hitherto been a common practice in reports on smallpox epidemics to show statistically how very much milder smallpox is amongst vaccinated patients than is the case amongst the unvaccinated. Tables have been compiled to show the large proportion of mild and trivial cases amongst the vaccinated, and it has often been pointed out that the more " efficient " the vaccination, *i.e.* the larger and the more numerous the vaccination scars, the greater the proportion of these trivial cases. Examples of these tables are given in Appendix VII.

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[1] *Allbutt's System of Medicine*, First edition.

[2] It was no doubt an exaggeration to say "almost without exception," but if we substitute the words "very often" the statement is correct.

A brief reference to them may be made here. Dr. Davies, M.O.H. for Bristol, in his *Smallpox Report* for 1893–4 (p. 14) gives a table in which he classifies the cases of smallpox into four groups: Trivial, Discrete, Confluent, and Hæmorrhagic. His definition of the " trivial " group is as follows: " very mild discrete cases, in which, after the initial fever (which may be severe) and the eruption of a very sparse crop of papules, sometimes not more than one or two, all constitutional symptoms at once and finally disappear, no secondary fever supervenes, and, but for the presence of a few abortive vesicles and pustules, the patient is quite convalescent."

Without doubt this is just the type of disease which provides the unrecognised cases which we are considering. Dr. Davies found that amongst vaccinated patients 30·9 per cent. of all those attacked belonged to this " trivial " group, whilst amongst unvaccinated patients only 7·3 per cent. could be so classified. Moreover, amongst those who had been what is generally called "well vaccinated"—*i.e.* with four or more marks—the proportion of these " trivial " cases was as high as 41·7 per cent.

At Manchester, in 1892–3, where the cases were divided into mild, discrete, confluent, and hæmorrhagic, Dr. Coupland found that there were no mild cases amongst the un-vaccinated; amongst the vaccinated the proportion was 25·4 per cent.; whilst amongst those with four vaccination scars there were as many as 47·7 per cent.

At Bradford, for the same period, Dr. Coupland found the proportion of mild cases was 27·5 per cent. amongst the vaccinated, and only 3·9 per cent. amongst the un-vaccinated. Amongst the " well-vaccinated " it was as high as 45·4 per cent.

Frank Admissions

A few medical officers of health have not hesitated to admit openly that vaccination has the tendency which we are now considering.

Thus Dr. P. Boobbyer, M.O.H. for Nottingham, has written : " One of the principal difficulties encountered in the preventive treatment of smallpox at the present time is due to the effect of vaccination, or rather insufficient vaccination. Vaccination not sufficiently recent or thorough to produce complete immunity . . . may yet so modify the eruption of smallpox as to render diagnosis extremely difficult, especially to those with small experience of the disease. It may also render an attack so mild as to allow the person affected to pursue his ordinary occupation without intermission, and particularly during the most infectious period, the period of rash ; for while most people, even with the mildest of attacks, feel somewhat poorly in the earlier stages—with feverishness, sweating, sickness, back pain, etc.—relief is in all cases experienced on the appearance of rash, and in mild cases there is seldom any illness afterwards. It may be noted that it was as much because of the extreme danger to the public through infection emanating from mild cases, as for any other reason, that inoculation for smallpox was made penal in the last century. . . ." (*Health Report*, 1902.)

No doubt Dr. Boobbyer would say—or he would have said so at the date when the above lines were written—that the remedy for this detrimental effect of vaccination was compulsory re-vaccination. But at the present day it is admitted that there is not the slightest prospect of getting compulsory re-vaccination in this country. So that to suggest compulsory re-vaccination is scarcely a satisfactory answer.

Drs. Ricketts and Byles, in the opening paragraph of their exhaustive work, *The Diagnosis of Smallpox*, write : " The times have changed since the days of Jenner. Besides that we have less practice in the art, several circumstances cause the diagnosis of smallpox to present to us more difficulties than to our forefathers. *To Jenner we owe the chief of these difficulties.* Through him, smallpox has become a different disease, easier to suffer, but harder to distinguish. . . . " (Italics added.)

The most emphatic and outspoken utterance, however, which I have yet come across occurs in an article published in *The Medical Chronicle* in 1893, by Dr. J. H. C. Dalton, entitled, "Smallpox in its Relation to Vaccination." After summarising the effect of vaccination upon the individual, he wrote as follows: "That the community are benefited, however, is a much more doubtful point. In the first place it may be asked, Does vaccination prevent epidemics? That it does not absolutely prevent them is seen by the Sheffield epidemic; the recent mild epidemic at Leicester also shows that careful attention to sanitary matters, even in an un-vaccinated district, may keep the disease under control. *But it may even be urged . . . that infantile vaccination may promote rather than arrest an epidemic,* for two reasons. In the first place, it has often been observed that the origin of an epidemic has been in two or three vaccinated persons, who had the disease in such a mild form that it was not recognised until late. During their infective period, therefore, they have been spreading infection in their neighbourhood, and hence the epidemic has originated. Now vaccination undoubtedly causes the cases to be mild; *if vaccination had not been systematically performed . . . prompt means of isolation could have been at once taken, and possibly the epidemic could have been stamped out before it had commenced to rage. . . . . For these reasons I am inclined to doubt whether infantile vaccination is such an unmixed blessing to the community that the State should enforce it by legal penalties*" (italics added).

Unrecognised Cases in the Un-vaccinated

Since attention was first called to this unfortunate tendency of vaccination to encourage the spread of smallpox by masking the disease, it has been urged that unrecognised cases of smallpox may occur in persons who have never been vaccinated.

This is undoubtedly true. Such cases, however, are very rare in comparison with unrecognised cases in vaccinated subjects. Moreover, unrecognised cases in un-vaccinated subjects may be divided into two classes: (1) Cases where a medical man is called in, but fails to diagnose the disease. Here it is certainly the fault of the medical man, because it is admitted that the diagnosis of smallpox in un-vaccinated subjects is a comparatively simple matter.[1] (2) Cases where no medical man is called in. In practice these cases only occur when the prevailing "strain" of disease is exceptionally mild and favourable. In these instances, the mildness, being a natural characteristic, is transmitted, *i.e.* it "breeds true." Consequently only a mild and favourable type of disease is spread by them, which causes little or no loss of life. There is, therefore, a great difference between an outbreak of smallpox originated by an artificially mild unrecognised case occurring in a vaccinated subject, and an outbreak originated by a naturally mild unrecognised case occurring in an un-vaccinated subject.

The Experience of Individual Towns

LEICESTER

We will now see how far the above statements are supported by actual facts drawn from the experience of individual towns, and it will be well to begin with my own town, Leicester, although we shall deal with Leicester more fully in a later chapter.

A number of striking examples illustrating the danger of unrecognised cases occurring in once-vaccinated subjects were recorded by my predecessor, Dr. J. Priestley, in his reports on smallpox in Leicester in 1892–3. The whole outbreak originated in unrecognised cases, as we shall see later, but one of these may be quoted here. George H., aged 21 years, vaccinated in infancy and described by Dr. Priestley as "well vaccinated," was taken ill with headache and pains in the back. A day or two afterwards spots appeared, and he stayed away from work for about a fortnight. Unfortunately his medical attendant failed to recognise the real nature of the disease, and no precautions were taken. He was allowed to be about the house as usual, dining, etc., with the rest of the family. The result was as might be expected, and it well illustrates how serious these unrecognised cases are. There were seven other persons in the house, including his wife, his brother, a lodger, his brother-in-law and sister-in-law, and two children. Every one of these contracted the disease, and, as Dr. Priestley carefully points out, the un-vaccinated suffered severely and the vaccinated very lightly, so that the credit of vaccination from the orthodox point of view was fully upheld. In addition to the actual inmates of the house, other persons who had visited the house were infected, and they in turn infected others. Moreover, when one of the children in the house was taken ill and developed spots, he was sent to another house in another street to be nursed, with the result that four persons in this house caught the disease ; here again we are told that two of these, being well vaccinated, had very mild abortive attacks; whilst two others, being un-vaccinated, suffered very severely, one having a semi-malignant attack and being left badly marked. The father of this family also infected a fellow workman, who had been vaccinated, and who had a very mild attack. The nature of this was not recognised at the time ; and he in turn infected his two unvaccinated daughters.

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[1] The only exception to this is in the case of malignant or hæmorrhagic smallpox, which occasionally does give rise to real difficulty. Fortunately these cases are very rare.

Dr. Priestley concludes : " We have thus seen how, from an unrecognised case, George H., have arisen twenty-six other cases of smallpox."

The etiology of the outbreak is shown graphically in Diagram V.

Now I suggest that if George H. had never been vaccinated, he would have had a more severe, but at the same time a more definite attack, and the chances of the medical man failing to recognise the case as smallpox would have been very greatly reduced.

Had the case been recognised, all the chapter of accidents related above, which led to the infection of so many innocent persons, could easily have been prevented. Instead of moving about the house and infecting his family, the man would have been promptly removed to hospital ; the rest of the family could then have been at once vaccinated, and it is almost certain that none of them would have been attacked.[1] Other persons would have been prevented from visiting the house; the inmates of the house would not have visited other houses ; and the baby would not have been sent out to nurse. Few diseases can be more easily controlled than smallpox, provided always that the first case is promptly recognised and proper preventive measures at once applied.

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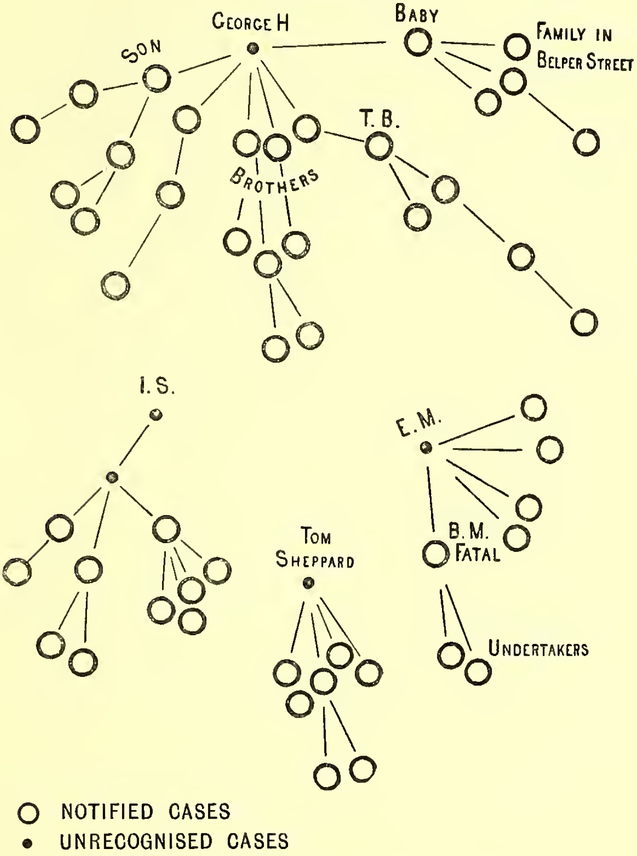
[1] The value of vaccination if it can be performed within the first few days of the exposure to infection will be referred to in Chapter IX.

Dr. Priestley gives a number of other similar examples where mild overlooked cases in vaccinated subjects spread the disease to un-vaccinated persons, and usually in a severe form.

I now come to my own experience of the part played by unrecognised cases of smallpox in Leicester. The first serious outbreak with which I had to deal was at the Leicester Workhouse in December, 1902. A tramp, aged 60, vaccinated in infancy, who had walked from Yarmouth to Leicester, was admitted to

DIAGRAM V



Smallpox in Leicester, 1893

Disastrous Effect of Unrecognised Cases.

the Workhouse and began to sicken the next day with a mild modified attack of smallpox. Unfortunately the nature of his illness was not recognised, and for six days he was not isolated and no precautions were taken. In the meantime he was living in close contact with some sixty other inmates. The result was that six of these contracted the disease, and in turn infected fourteen other inmates before the outbreak was stamped out. Thus, owing to this man's illness being unrecognised—and this, I submit, was largely owing to the disease being masked by vaccination—twenty other persons contracted the disease, of whom two died. Again I suggest that if this man had never been vaccinated, he would have had without doubt a more severe attack, which would have been worse for him personally, but very much better for every one else concerned.

At the same time, I frankly admit that unrecognised cases may, and occasionally do, occur in un-vaccinated persons, as the next cases I shall relate will prove; but I want first to emphasise again the very important point that whenever unrecognised cases of smallpox occur in un-vaccinated persons, it is almost invariably for one of two reasons: Either (1) the medical man called in has failed to diagnose the disease (this is the usual reason), or (2) the prevailing type is so mild and benignant that even in un-vaccinated persons the symptoms are not severe enough to call for medical attendance. It may reasonably be expected that when more attention is paid to the subject of smallpox diagnosis in medical education [1] the first reason will almost entirely disappear; whilst, as regards the second, comparatively little harm results so far as danger to life or permanent disfigurement is concerned.

I will now relate an outbreak which did originate in an un-vaccinated case, or rather in two such cases. A young woman, Elizabeth C., aged 18, un-vaccinated, had a discrete attack of smallpox of a mild type. She was sufficiently ill to require a medical man, but unfortunately the symptoms were so mild that the latter mistook the case for one of chickenpox, and consequently no precautions were taken. She stayed at home but continued to mix with the rest of the family, and after a week she returned to work in a boot factory. At the end of twelve days, as the eruption did not clear up, she went as an out-patient to the

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[1] I am dealing with this question in my final chapter.

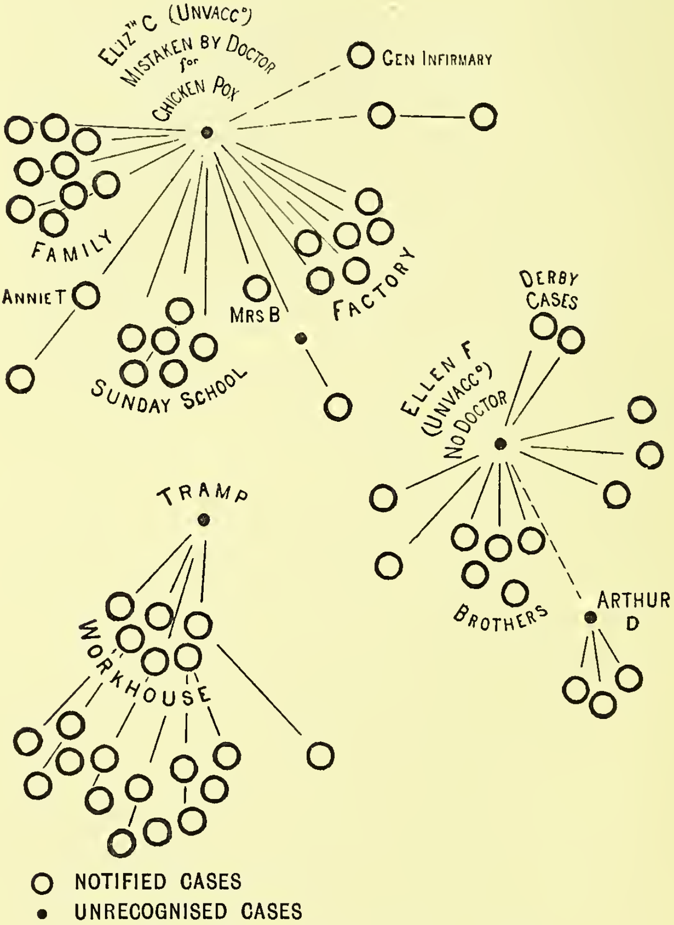
General Infirmary, where the real nature of her illness was discovered, and the case was then reported. The result of the failure to diagnose this case was as follows: The young woman infected every member of her family, consisting of father and mother, and seven brothers and sisters; she infected two neighbours; also (presumably) a man who had been in the neighbourhood; also six employees at the factory where she worked; also an out-patient at the Infirmary. Two of her sisters who attended Sunday-school whilst she was at home ill—but before they themselves sickened—carried the disease to the school, and infected five scholars and a teacher. Altogether, twenty-five cases were clearly traceable to this one case. I think it will be admitted that this was giving the disease a fairly good start, especially in an un-vaccinated town. Fortunately we got on the track of all these cases just in time, the usual steps were promptly and energetically taken, and *only two further cases resulted from these twenty-five cases*—a striking illustration of what can be done by modern methods, even in the presence of an un-vaccinated population.

We were informed, through Elizabeth C., that a friend of hers, Eliza F., was ill with a similar attack, which was also thought to be chickenpox, and that she had sickened about the same time. We at once visited the case, and found that this second girl was also suffering from smallpox of a similar mild character. She had not consulted a doctor. We were, of course, too late to save her family, five of whom developed the disease; and she also infected four friends or neighbours who had visited the house, an uncle whose house she had visited, and an insurance agent. The latter was not a known contact, so was not under observation. He had been vaccinated in infancy, and had such a mild attack that he consulted no doctor and returned to work after a couple of days in bed.

He infected two out of three of his un-vaccinated children, and also his vaccinated wife, who had an attack of "varioloid" without eruption.

Eliza F. also infected two men from Derby who had visited her house, thus making sixteen cases in all infected by her. No further cases, so far as was known, resulted from this outbreak, so that altogether Elizabeth C. and Eliza F. gave rise, directly and indirectly, to forty-one cases. Fortunately, however, the mildness of the two original cases, being a natural characteristic and not due to vaccination, was transmitted, with the result that most of the secondary cases were also mild, and only one out of the forty-one proved fatal.

DIAGRAM VI



SMALLPOX IN LEICESTER, 1903

DISASTROUS EFFECT OF UNRECOGNISED CASES.

Eliza F. and Elizabeth C. were friends ; they worked at the same factory, and sickened almost simultaneously. No doubt they were infected from the same source, but this was never discovered. Had the first case, Eliza C., been diagnosed by the medical man who was called in, we should have discovered the other case also (as we subsequently did as soon as the first case was reported) and the whole double outbreak could almost certainly have been cut short at the outset.

The mischief done by the two unrecognised cases in this outbreak is shown graphically in Diagram VI.

CHAPTER VI

THE TENDENCY OF VACCINATION TO SPREAD SMALLPOX (*Continued*)

The Experience of Other Towns—London: Fatal Outbreak at Mile End Infirmary Caused by Vaccinated Child—Kirkcaldy: Fatal Outbreak Caused by Vaccinated Child—Ossett: School Outbreak of Very Mild Type Caused by Unvaccinated Child—Newhaven: Fatal Outbreak Caused by Sailor (presumably Vaccinated)—Halifax: Disastrous Effect of Unrecognised Cases in Vaccinated Persons—Coventry—Cardiff.

In order to show that the experience of Leicester related in the last chapter is in no way exceptional I will now give the experience of some other towns.

LONDON

Dr. W. McC. Wanklyn, Assistant Medical Officer, London County Council, in a valuable little work entitled *How to Diagnose Smallpox*—which might well be made a text-book in every medical school[1]—devotes the first two chapters to the spread of smallpox by unrecognised cases. His opening lines are as follows:

" It is essential to realise the mischief which may be done by unrecognised cases of smallpox. There is hardly any disease of which the prompt recognition is more important to the general community. Almost every outbreak in London in recent years has been started, or propagated and prolonged, by unrecognised cases. Epidemics teem with examples, which only cease to be recorded because they become trite."

He then proceeds to give examples, the first three of which may be briefly summarised here:

(1) Smallpox broke out in a crowded locality in Shoreditch.

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[1] A larger and more exhaustive work is Ricketts and Byles' *The Diagnosis of Smallpox*, which ought to be studied by every candidate for a Public Health Diploma.

The source of infection was a child who fell ill with smallpox, but was diagnosed as a case of chickenpox. From her the disease spread to the other inmates of the same house, and thence rapidly to the surrounding population.

(2) A young man suffers from "influenza with spots." He infects a fellow workman who was supposed to have "chickenpox." These two cases between them were the direct cause of eight cases of definite smallpox.

(3) A man is taken ill and is supposed to be suffering from "blood poisoning," accompanied by an "eruption of spots." He infects a woman who is supposed to have "chickenpox." She infects, directly or indirectly, six persons who have definite smallpox.

It is unfortunate that the vaccinal condition of these unrecognised cases which originate outbreaks is frequently omitted. I am quite satisfied that in the great majority of them the patients will be found to have been vaccinated many years before, and to have become partially "de-vaccinated." They no longer possess sufficient protection from the vaccination to save them from attack, but they only get a mild and often highly modified illness, which easily escapes recognition.

Possibly the medical men responsible for recording these cases really think the fact that the patients have been vaccinated many years before is of no importance, and so they make no mention of it. But it may be observed that if by chance the patients happen to be un-vaccinated, this fact is almost invariably recorded, and usually considerable prominence is given to it. So much is this the case, that I believe it is fairly safe to assume, where the vaccinal condition is not stated, that the patient has been vaccinated.

Dr. Wanklyn says that such instances as he quotes "could be multiplied to fill a volume." This is certainly true, and as their serious significance has not yet been sufficiently appreciated, I think it would be a very good thing if some one would take the trouble to fill a volume and press home the lesson to be learnt from them.

Dr. Wanklyn's remedy for this most regrettable state of things is better education of medical students in the diagnosis of smallpox. Undoubtedly this would be a most important step. Indeed, I venture to say such a step is imperative if the profession is to do its duty by the public, and also to uphold its own dignity and reputation; but I shall say more of this at a later stage. In the past, this part of a medical student's education has undoubtedly been very much neglected.

The Case of Annie Levy and the East End Outbreak, 1911

This outbreak, which threatened at one time to become exceedingly serious, illustrates very well both the extreme danger arising from overlooked cases, and also the remarkable success attending modern methods of prevention vigorously and promptly applied. The outbreak occurred in the East End of London early in 1911, in connection with the Mile End Poor Law Infirmary.

The facts were as follows: A girl named Annie Levy, aged 12, was living in Key Street, Stepney. It is important to note that she had been vaccinated in infancy. Dr. Wanklyn, in another excellent little book recently published by him—*The Administrative Control of Smallpox*—devotes seven pages to the consideration of this outbreak, but *entirely omits any reference to the fact that this child, the cause of the outbreak, had been vaccinated!* Did he imagine that the fact was of no significance? and would he have made no reference to it if she had happened to have been un-vaccinated? I would not have dwelt on this, but I have so frequently found, in the course of my inquiries, the same omission as to the vaccinal condition of persons who have spread infection that I cannot help thinking that medical men have a reluctance to mention anything which might seem to reflect—unfairly, no doubt, as they believe—upon vaccination. I wish to emphasise, then, the fact that this child, Annie Levy, aged 12, the sole originator of the outbreak we are now considering, *had been vaccinated in accordance with law.*

The attack, as we should expect in the case of a vaccinated child, was a modified one, and although she was taken to the Out-patient Department of the London Hospital on three different dates (twice after the appearance of the eruption) the case was diagnosed as one of chickenpox. The patient was given some medicine and was eventually removed to the Mile End Poor Law Infirmary, being admitted to a ward containing sixty women and children.

She was there seen by the Medical Superintendent and Assistant Medical Officer, and they also failed to recognise the real nature of the case. This is not really so astonishing when we consider how difficult the diagnosis of smallpox in vaccinated children often is. Although modified in its character, the attack in this case appears to have made the child seriously ill and she was placed on the visiting list. She was seen by her friends frequently, and a large number of the public also visited this ward and were allowed to go inside.

The consequences of this error of diagnosis were about as disastrous as they possibly could have been. Annie Levy remained in the open ward for a whole fortnight, from February 5th to 20th, and the real nature of her attack was only discovered when other patients in the ward began to sicken with unmistakable smallpox. First, two patients sickened and were removed to the Smallpox Hospital, together with Annie Levy. The next day, February 21st, two other patients sickened in the same ward; also an Infirmary scrubber living outside in her own home. Also a sister of Annie Levy, aged 10, was found to be suffering from smallpox at Annie's home. On February 22nd, two more sisters, aged 8 and 15, were certified; also another patient (fatal) from the Infirmary, and a nurse. On February 23rd, ten more patients (one fatal), were certified, and a second nurse; and then a brother of Annie Levy. It may be observed that her family had been visiting her daily whilst she was in the Infirmary, and so would be very much in contact with her. On February 24th, two further patients (one fatal) were certified, and a third nurse (fatal). On February 25th, five more patients (one fatal) and a friend of Annie Levy who had visited her in the Infirmary. On February 26th, a patient who had been discharged from the Infirmary was certified. On the 27th and 28th two more patients (both fatal), one each day, were reported. Altogether, up to March 9th, there were fifty-two cases, ten of which proved fatal. Further cases occurred before the outbreak was stamped out, bringing the total to about seventy. No less than five of the persons attacked were nurses.

For the benefit of those who believe that the complete immunity enjoyed by nurses in smallpox hospitals is not due to the fact that they have been recently vaccinated, but to some peculiarity in a nurse's calling, I would draw attention to the fact that, where nurses have not been recently vaccinated (and none of the five nurses attacked in this outbreak had been recently vaccinated), they are just as liable to contract smallpox, and in a serious form, as the rest of the community.

It is to be noted that all the Levy children appear to have been duly vaccinated in infancy, the youngest being Rebecca, aged 8, and she appears to have had the ordinary mild modified attack usually seen in vaccinated children. After the eruption appeared, she also was taken to the London Hospital, where she was seen by a different doctor from the one who had seen Annie. He also diagnosed chickenpox. She returned to school, but fortunately she only attended one day before she was removed, in consequence of the discovery of her sister's case at the Infirmary. Otherwise a school outbreak would almost certainly have followed.

Considering what a start the disease was given, in the very heart of the East End, it is really astonishing that the outbreak was got under control and stamped out as quickly as it was. As a writer at the time put it: "If we were asked to invent a prize method for disseminating a fell disease, could one have discovered anything more likely to scatter smallpox throughout London?" I think we may say that, but for the extremely energetic measures that were taken when once the real nature of the disease was discovered, more especially the prompt notification and removal to hospital of all cases as they occurred, together with the hunting up and keeping under surveillance of all the enormous number of contacts, it is virtually certain that a serious epidemic in the Metropolis would have resulted. That it was stamped out, in the way it was, constitutes a striking proof of the efficacy of modern methods of checking the spread of smallpox, even under most serious difficulties.

As regards the way in which the first case, Annie Levy, contracted the infection, it was believed that she was infected through visiting, on January 21st, another girl, also supposed to be suffering from chickenpox. No statement being made as to this girl's vaccinal condition, we may assume, I think, that she, too, had been vaccinated in infancy.

In spite of the fact that there had been a good deal of vaccination default in the East End during the few preceding years, it was remarkable that such a large proportion of the cases which occurred were in once-vaccinated persons. Thus, out of the first fifty-four cases, *no less than forty-one were in vaccinated persons.* Of these forty-one no less than eight were persons under fifteen years, whilst of the latter, three were under five years.

After these facts, it seems fatuous to suggest that the outbreak we are studying was in any way due to the fact that numbers of the children in the neighbourhood had never been vaccinated.

Yet the pro-vaccinist Press did not hesitate to do this. The following paragraphs appeared in *The Pall Mall Gazette,* and they illustrate well the extreme views that are held in some quarters :

" The feeling has of late been gaining ground in well-informed circles that the anti-vaccination campaign, and the deplorable effect it has had upon legislation, would before very long lead to the reappearance of the hideous disease which vaccination had practically stamped out." (*Pall Mall Gazette,* February 25th, 1911.)

" The outbreak of smallpox at Mile End is regarded by medical authorities . . . as a result of the prejudice that has long existed in the district against vaccination. For years the Mile End Guardians have been anti-vaccinators, discouraging vaccination in every direction, and refusing to allow the children of pauper parents to have the benefit of this preventive treatment. The result has been that a large unprotected population has grown up, and the soil has been waiting only for the seed. The agitation against vaccination is one of the most idiotic things which even our sentimentalists in their record of imbecility have ever carried on." (*Pall Mall Gazette,* February 24th, 1911.)

At the time this was written there had been twenty-five cases, and *only two* of these cases were in un-vaccinated persons, one of the two being a baby only a month old, and therefore below the age limit for compulsory vaccination. Moreover, the outbreak had originated, as we have seen, in a vaccinated child.

One other Press opinion is worth quoting, and is perhaps a good deal nearer the mark than the above :

" One fact about the outbreak should be carefully noted by local authorities. The infection began, as usual, in one of the most insanitary districts of the East End, and is a stern reminder of the danger which such unhealthy regions are to London's vast population."

I wish to draw special attention to the difference between the type of the disease which was spread by this vaccinated child, Annie Levy, in London (a comparatively well-vaccinated town), and the type of the disease spread by the un-vaccinated girls, Elizabeth C. and Eliza F., in Leicester (a very badly vaccinated town). Annie Levy is the cause of some seventy cases, ten of which prove fatal (*i.e.* 14 per cent.) ; the two Leicester girls are the cause of forty-one cases, one of which proves fatal. Is it quite certain that this was pure coincidence ?

KIRKCALDY

A very interesting outbreak of smallpox, which attracted considerable attention, occurred in 1912 in Kirkcaldy, a Scotch burgh of 40,000 inhabitants.

The outbreak began in September, and resulted in the occurrence of forty-two cases, no less than fourteen of which, or 32·5 per cent., proved fatal.

Prior to the outbreak, infantile vaccination had been somewhat neglected in Kirkcaldy, only about 61 per cent. of the births having been vaccinated since the passing of the Scottish Conscience Clause in 1907. As no case of smallpox was known in any part of Scotland at the time, it was surmised by the Medical Officer of Health that the infection had been introduced into the town through the medium of flax, the first case which occurred being in a boy employed at a flax-mill. It is in connection with this first case that the great interest of the outbreak, from our present point of view, centres. This first case was apparently the only one infected by the flax, or whatever the real source of infection was. Now, had this first case been an unmistakable one—such as usually occurs in an un-vaccinated subject—and been promptly recognised, the usual precautionary measures, such as isolation, surveillance and vaccination of contacts, disinfection, etc., would have been carried out, and there is reason for thinking that the outbreak would then have been nipped in the bud and have spread no farther. What actually happened, however, was as follows : The first case happened to be a boy, 14½ years of age, *who had been vaccinated in infancy,* in accordance with the law of the land. Having been vaccinated, the attack, instead of being of a very definite character, was considerably modified, and although a medical man was called in he failed to recognise the case as one of smallpox but regarded it as one of chickenpox. In consequence of this most unfortunate mistake no precautions were taken, and for about three weeks the lad was disseminating the infection of smallpox broadcast without any attempt being made to check it. The result was most disastrous. Four other members of the family of this first case, and a large number of contacts, developed the disease. Altogether forty-three cases occurred before the outbreak could be extinguished, and very great expense (for a town of this size) was incurred. What was most serious, however, was the fact that so many of the cases proved fatal, showing that although the first (vaccinated) case was apparently so " mild," the type of disease spread by it was really very severe.

Now it is necessary to emphasise the fact that, humanly speaking, the cause of this unfortunate outbreak was the failure to recognise the real nature of the first case, and that this failure was due possibly to lack of skill and proper training of the medical man who was called in to attend the case, but also, as I submit, to the fact that the real nature of the disease was *masked*, owing to the patient having been vaccinated. It is almost certain, from our knowledge of what this type of smallpox is like in un-vaccinated subjects, that, had this lad of fourteen years not been vaccinated, the nature of his attack would have been easily and at once recognised, and in all probability the outbreak would have been cut short at the outset.

I am not making this statement recklessly or without due consideration of all it implies as regards the practice of infantile vaccination. We now know that smallpox is a comparatively easy disease to control and prevent from spreading, provided only that the nature of the disease is recognised early, *i.e.* within the first few days of the appearance of the eruption. Infantile vaccination tends inevitably, by its very success in mitigating smallpox, to thwart our efforts to stamp it out. It may be urged that it was better for the lad himself that he had been vaccinated. Undoubtedly! Better for that one lad, but how much worse for the forty other persons whom he infected, fourteen of whom lost their lives!

Before leaving the Kirkcaldy outbreak, it may be well to refute any suggestion that the fact that vaccination had been neglected in the burgh had anything to do with the rapid spread of the disease. In spite of the fact, already stated, that during the preceding five years only about 61 per cent. of the births had been vaccinated, no un-vaccinated case occurred in a child under five years of age, with the solitary exception of a baby infected by its mother before birth (and which, of course, could not have been protected by vaccination in any case); and there were only two un-vaccinated cases between five and ten years. Moreover, thirty-three cases, or 77 per cent., were found to have been vaccinated. Of these vaccinated cases, eight, or 24·2 per cent., proved fatal.

The Medical Officer of Health for Kirkcaldy (Dr. McIntosh) suggests that other unrecognised cases, besides the first one, played a part in the spread of infection, and says that it is only thus that the source of infection in some of the cases can be accounted for.

In spite of the fact that the Kirkcaldy outbreak affords evidence so adverse to the practice of infantile vaccination, demonstrating so clearly its drawbacks and also the absence of very serious danger amongst the un-vaccinated children, Dr. McIntosh still adheres faithfully to the orthodox views on the subject, and writes in his *Report* on the outbreak as follows: "Six school children contracted smallpox. Two of these . . . were un-vaccinated, the other four . . . had been more or less efficiently vaccinated in infancy. . . . Had this outbreak of smallpox been delayed another five years a large number of un-vaccinated children, exempted through the loophole of the conscientious objection clause, would have been attending these schools, and the consequences would have been appalling to think of."

When we come to consider the experiences of Leicester and Dewsbury, where so many of the school children were un-vaccinated, we shall see how little ground there appears to be for Dr. McIntosh's apprehension.

Again I wish to draw a comparison between the type of disease spread by the vaccinated lad, 14½ years old, in Kirkcaldy, and the type of disease spread by the two un-vaccinated young women in Leicester. The former gave rise to forty-two cases, fourteen of which proved fatal; the latter to forty-three cases, only one of which proved fatal. Was this also a coincidence?

The Ossett School Outbreak

Lest it be thought that I am making too much of the mildness of the Leicester cases, I will mention here the case of a school outbreak which occurred in 1904 in the Borough of Ossett, part of the Dewsbury Union.

Infantile vaccination in Ossett, as in Dewsbury, had been very much neglected, and in the year mentioned the district was invaded by a mild type of smallpox. Owing to the failure of hospital isolation and the occurrence of unrecognised cases the disease became very prevalent, and the public elementary school at Commonside became infected by the attendance of an un-vaccinated scholar suffering from a very mild type of the disease. Had the prevailing type of disease been otherwise than extremely mild, an un-vaccinated child suffering from smallpox would not have been able to continue attending school. As the child had never been vaccinated, the mildness of her attack was transmitted,[1] and although no less than forty-two other scholars were attacked (showing how intensely infectious smallpox can be), *not one of these cases proved fatal*!

NEWHAVEN

Another outbreak which caused considerable stir occurred in Newhaven early in 1913; it received considerable notice both in the lay and medical press, and as several of the cases were in un-vaccinated children (for which exemptions had been obtained) and proved fatal, the foolishness of neglecting vaccination was duly emphasised. *The Jennerian*, the official organ of the Association of Public Vaccinators, naturally made the most of it, coming out with a bold headline as follows:

"EXEMPTION—AND DEATH!

"As we go to press, further details of the outbreak of smallpox at Newhaven have reached us from a reliable source. *A parent who had taken out exemption from vaccination for five children has,*

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[1] In order to prevent possible misapprehension let me repeat that I am not arguing that the type of infection spread by un-vaccinated cases is usually mild; I am only referring to cases overlooked because of their trivial character. Such cases in the un-vaccinated do tend to spread a mild form of the disease, which is not so with similar cases in vaccinated subjects.

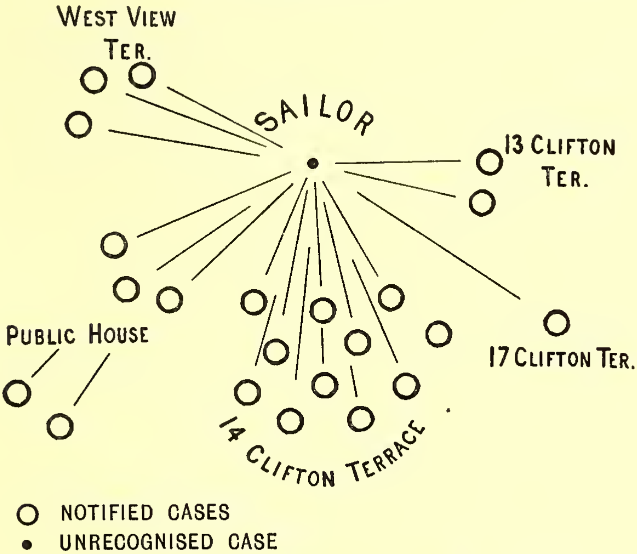
we are informed, had the terrible experience of seeing no less than three of these die on successive days from smallpox. Sympathy can be extended to the parents, who will now be repenting what they have done for so-called conscience' sake, at the instigation of professional agitators and others. We do not think the masses are to blame for the extensive outbreak of pseudo-conscientiousness at present in evidence throughout the country. The blame can be divided between the authorities and the National Anti-Vaccination League."

Altogether there were twenty-two cases, with five deaths. Ten of the cases had never been vaccinated, and all the deaths occurred amongst these ten. Could there be stronger testimony as to the value of vaccination! If we study the whole facts of the outbreak, however, it is possible that vaccination will appear in a different light. The following particulars are extracted from the *Report* of Dr. Parkhurst, the Medical Officer of Health. It appears that on January 18th, 1913, at a time when no thought of smallpox in the town existed, the Medical Officer of Health received notification of no less than eight cases of smallpox in one house, No. 14, Clifton Terrace. The house contained in all twelve persons, and those found to be suffering from the disease were the occupier, his wife, five children, and an adult lodger. The children, who had never been vaccinated, had severe attacks, and, as already stated, three of these proved fatal. On January 23rd another case of smallpox was notified from No. 13, Clifton Terrace, in a person who had been in constant communication with No. 14; and another of the inmates of No. 14 was discovered to have the disease on the following day. On January 25th two more of the inmates of No. 14 sickened with the disease; also one at No. 17, and a second case at No. 13. Another case was also discovered on this day on the opposite side of the road. Energetic measures for the suppression of the outbreak were taken by the Medical Officer of Health, and in spite of the considerable opportunity given to it for spreading it was quickly stamped out.

It is, of course, a deplorable fact that five un-vaccinated persons should have lost their lives from smallpox, and it may reasonably be contended that, had they been vaccinated, the chances of the attacks proving fatal would have been greatly reduced.

But the really important point, I submit, is the *cause* of the outbreak. Why should this large number of cases have occurred almost simultaneously and without warning in and around one house? The explanation was soon discovered by Dr. Parkhurst in the course of his inquiries. It appears that a sailor, a brother of the occupier of the house, had arrived from abroad on a visit some weeks previously, and had left again on another vessel ten days before the outbreak was discovered. Dr. Parkhurst states in his *Report*: "During the period of his visit I am informed that he developed an illness, the symptoms of which were aching in the back, and giddiness, followed by an eruption of blotches and pimples, but apparently he did not consult a medical man." This kind of history is so familiar to Medical Officers of Health who have had experience in investigating smallpox outbreaks, that it has become quite commonplace. The man was afterwards discovered, but he denied that he had had any illness at Newhaven. Dr. Parkhurst states, however:

DIAGRAM VII



SMALLPOX IN NEWHAVEN, 1913

DISASTROUS EFFECT OF UNRECOGNISED CASE.

"At the same time there is not the slightest doubt, in my mind, that he did have some illness while at No. 14 Clifton Terrace, as not only his brother, but some of the neighbours have informed me of the fact; I have not been able to trace any other possible source of the disease."

We are not informed as to this man's vaccinal condition, but no one who knows smallpox will suggest that he was un-vaccinated. The history of his illness, and the fact that he was a sailor, fully warrant the assumption that he had been vaccinated. This class of case practically only occurs in people who have been vaccinated. Had he been un-vaccinated he would almost certainly have suffered from a much more definite attack, he would have been obliged to consult a medical man, the disease would have been recognised (or ought to have been), and the whole outbreak would have been cut short; for as the Medical Officer of Health for Sheffield remarks: "Few diseases are more easily prevented from spreading than smallpox, provided the nature of the disease is promptly recognised."

So much has been said in the medical press about the neglect of vaccination in connection with the Newhaven outbreak that it has seemed only fair to point out another side of the question.

Incidentally, I may observe that this outbreak illustrates once again that the "mildness" in these unrecognised cases in vaccinated subjects does not "breed true," but may spread the disease in a most virulent form.

There is yet another aspect of this unfortunate outbreak which must not be overlooked. It has been already mentioned that eight cases were notified to the Medical Officer of Health on one day, this being the first intimation he had of anything amiss. As a matter of fact, however, several of these cases had occurred some time previously; yet although a medical man had been in attendance he had failed to recognise the real nature of the disease, and had been treating them for chickenpox. In the meantime, of course, no precautions were being taken, and this accounts for the fact that so many other persons were infected.

I understand that this particular medical man, although "qualified" to practise medicine, had never seen a case of smallpox before. Whether he had ever had any instruction in the diagnosis of smallpox I do not know. In any event he himself was not so much to blame as the system of medical education which turns out "qualified" medical men, certified as competent to practise their profession, without specially testing their competency as regards the diagnosis of this most dangerous disease. Yet no duty which a medical man may be called upon to perform is of more importance, so far as the community is concerned, than the prompt notification of smallpox.

To sum up the lessons of the Newhaven outbreak, we see that after all it was not so much the neglect of vaccination that was to blame but rather (*a*) the occurrence of an unrecognised case in a presumably vaccinated sailor; and (*b*) the inability of the medical man called in, when the secondary cases occurred, to diagnose the disease.

Once again, I must contrast the type of the disease spread by the (vaccinated ?) sailor at Newhaven with that spread by the two un-vaccinated girls at Leicester, or by the un-vaccinated child at Ossett.

HALIFAX

Some very instructive illustrations of the danger of unrecognised cases are given in a special report on smallpox in Halifax in the year 1903 by the Medical Officer of Health, Dr. J. T. Neech. In June, 1903, cases of smallpox began to occur in rapid succession, the source of infection of which could not be traced. This led the Medical Officer of Health to the conclusion that some one was moving about the town suffering from an unrecognised attack of the disease. Eventually the culprit was discovered in the person of a man, a tailor by trade, named Thomas Shepley, vaccinated in infancy, who was residing in a common lodging-house in Winding Street. He was then in a state of convalescence after smallpox, having had an illness with a rash some weeks before. He had consulted no medical man, but had been going about the whole time, taking no precautions. The result, which is shown graphically in Diagram VIII, was as follows:

At the shop where he worked he infected two of his fellow workmen, and one of these infected a third. At the lodging-house where he stayed he infected six other lodgers, and these in turn gave rise to seven other cases, and these in their turn to seven further cases. At the public-houses he frequented he infected seven persons, and amongst a gang of loafers who frequented and mixed with the inmates of the lodging-house he infected two others, who, in turn, gave rise directly or indirectly to eight further cases. Altogether, forty cases of smallpox between June 8th and July 31st were traced directly or indirectly to this one man. Moreover, six other cases were reported, the origin of which could not be traced, and the Medical Officer of Health thought it was quite possible that they also had their origin in Thomas Shepley.

Incidentally, it may be mentioned that Thomas Shepley himself is believed to have been infected by another unrecognised case, Ellis Walton, a bill distributer, to whom twenty-one cases were traced, directly or indirectly, and who also possibly infected five additional untraced cases. Thomas Shepley, as already stated, had been vaccinated, his scars having an area of half a square inch. He had a mild discrete attack, and without doubt the mildness of the attack, which was the primary cause of the disease not being discovered, was due to the fact that he had been vaccinated. I suggest that if this man had never been vaccinated all this extensive outbreak would have been prevented. The other unrecognised case referred to, Ellis Walton, is also stated to have been vaccinated.[1]

In August in the same year Dr. Neech reports five other cases which arose from a very mild case, the nature of which had not been discovered until the patient was convalescent. Dr. Neech points out how successfully smallpox can be controlled and prevented from spreading, provided the first case is promptly recognised. During the epidemic the disease found its way into fifty-six different houses, and in only eleven of these did any further cases arise. In forty-five cases the first patient was the only person attacked, although these houses were occupied by 165 persons, forty-nine of whom had never been vaccinated.[2] In all these houses the first (and only) case of smallpox was discovered and removed to hospital in the early stages of the disease, the majority being in the second or third day of eruption. Dr. Neech remarks: "Now these 165 remaining occupants of these houses, living and sleeping therein, must have been brought more or less into intimate contact with the patient, yet not one of them caught the infection. They were, of course, with very few exceptions, vaccinated or re-vaccinated after contact." In the remaining eleven houses, where spread of the disease did occur, the primary cases, except in one instance, were either overlooked altogether, or not diagnosed until the disease had reached an advanced stage. The result was that out of forty-three other occupants no less than sixteen, or 37 per cent., caught the disease. Dr. Neech states that smallpox had been introduced into Halifax on twelve different occasions, from as many sources, and yet had been kept under complete control, and it was not until the un-

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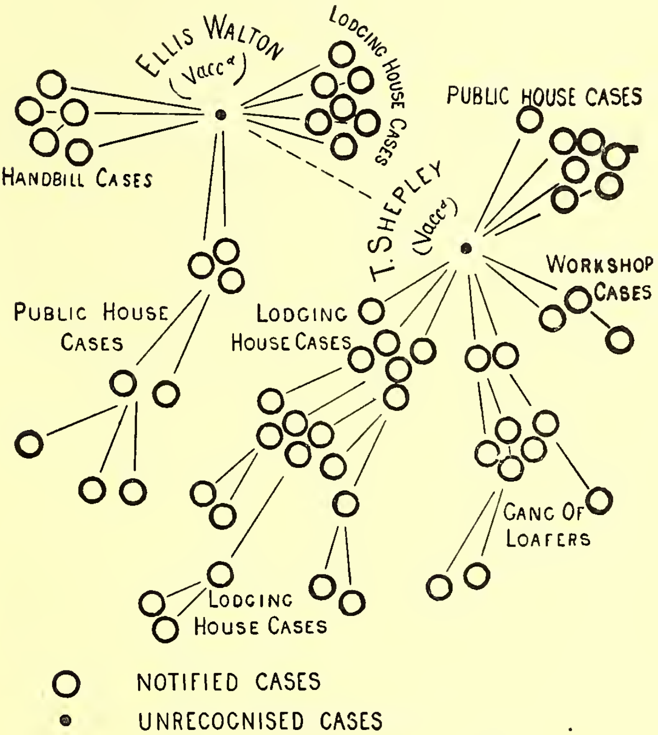
[1] No vaccination marks were discovered on this man; he had a fairly thick discrete attack, but the constitutional symptoms were not severe enough to oblige him to consult a doctor.

[2] *i.e.*, Prior to the outbreak of the disease.

DIAGRAM VIII



SMALLPOX IN HALIFAX, 1903

DISASTROUS EFFECT OF UNRECOGNISED CASES.

recognised cases, Walton and Shepley, appeared on the scene, that anything like a serious epidemic occurred.

Dr. Neech, at the conclusion of his report, makes the following statement: "The facts stated in this report, apart from the value of vaccination, go to show the great necessity that exists for early notification and isolation of cases of smallpox; that success in controlling an epidemic depends upon this, *and that it is the unrecognised cases, frequently of a mild type, which spread the disease*" (italics added).

Halifax is the home of Dr. Arthur Drury, the energetic founder and moving spirit of the Association of Public Vaccinators, Editor of *The Jennerian*, and deeply interested in the whole question of vaccination. He must have been quite familiar with the details related above as to how smallpox was spread in Halifax, yet in none of his writings or reported speeches on vaccination that I have seen is there any reference to this unfortunate effect of vaccination in spreading smallpox.

Dr. Coupland, writing ten years before in his report to the Royal Commission, had said: "It is instructive in many ways to notice how large a proportion of the patients could trace their infection (directly or indirectly) to cases which had been overlooked or missed. Most of these latter were of such a mild type as to have passed unrecognised at the time, and to be unattended by a medical man." Dr. Coupland mentions sixteen of such *foci* of infection, the number of secondary cases traced to them being sixty-two. One of these cases was that of a lad of fifteen (vaccinated, I have no doubt, though the fact is not considered to be worth mentioning), who had a very mild attack, and consulted no doctor, but continued at his work at a carpet factory. He infected two persons at his home (one fatal) and through them he infected indirectly three other persons who visited the house, and who came respectively from Keighley, Barnsley, and Leicester; each of these returned home and developed the disease in his own town. I submit that if the lad of fifteen had been un-vaccinated, he would have had a more severe attack, and it is much less likely that the attack would have escaped recognition. Had it been recognised, proper precautions would have been taken, and the spread of infection to Leicester and elsewhere would have been prevented. And yet it has been suggested that one reason for Leicester's comparative immunity from smallpox is that she is "surrounded by a cordon of vaccinated millions"![1]

COVENTRY

The Medical Officer of Health for Coventry, Dr. E. H. Snell, in his *Annual Report* for 1903, gives numerous instances of the spread of smallpox by unrecognised cases. In one of these, where four members of one family developed smallpox about the same time, suspicion fell on the husband, Mr. H. He denied any previous illness, but on examination was found to have some suspicious marks which, together with the fact that re-vaccination would not "take," made Dr. Snell quite satisfied that he had suffered from a mild unrecognised attack of smallpox. He had been vaccinated in infancy, and had three good marks with a total area of one and a half inches. The result of his attack not being recognised was that he infected his wife and three children, four neighbours, and a neighbour's child; and these in turn gave rise to six other cases, a total of fifteen. One of the children, who was un-vaccinated, had a severe fatal attack. Another outbreak at a lodging-house in West Orchard, Coventry, which comprised some eighteen or twenty cases, was believed to have been due to an unrecognised case in a tramp whose actual identity was not discovered. Yet another outbreak arose from an unrecognised case which, in turn, had been infected by an unrecognised case at Blackpool, and which gave rise, directly or indirectly, to thirteen cases. The experience of Coventry is illustrated graphically in Diagram IX.

Dr. Snell suggests that as we could cut short any epidemic of smallpox which might occur by universal vaccination, there is no need to regard the possibility of an extensive epidemic of smallpox as a very real danger. He writes:

"I am doubtful whether an epidemic of smallpox can ever be regarded as 'alarming.' Here is a disease which is absolutely preventable, and we have it in our power, that is, the people have, to check entirely the most severe and rapidly spreading epidemic. Within three weeks the most extensive epidemic could absolutely be put an end to by every one being re-vaccinated (or vaccinated). The only difficulty to be surmounted would be the physical one of vaccinating a large number of people in a short space of time. . . ."

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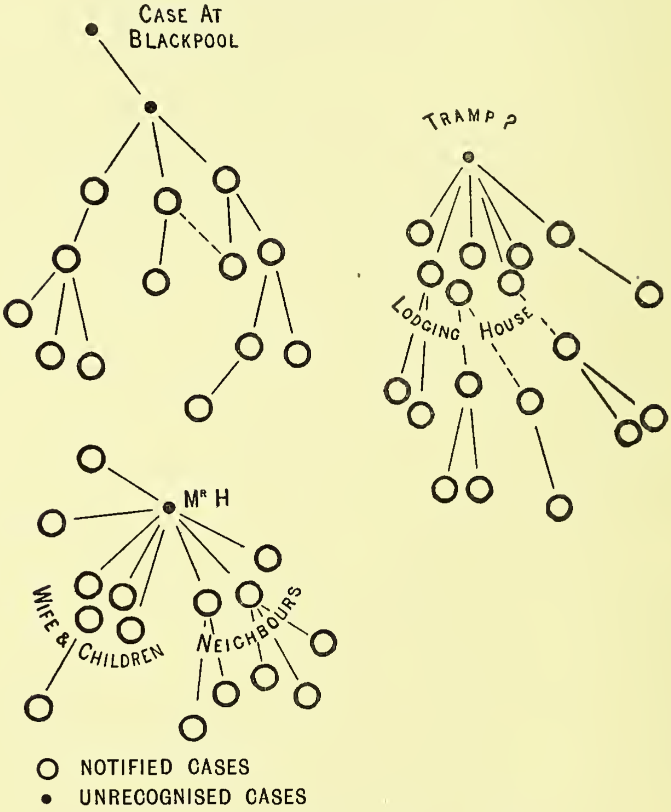
[1] McVail, *Vaccination vindicated*, p. 149.

There is no doubt that the fact that we have, in universal vaccination, an infallible *dernier ressort,* should an epidemic ever get out of hand and isolation break down, constitutes what may

DIAGRAM IX



Smallpox in Coventry, 1903

Disastrous Effect of Unrecognised Cases.

be called the "trump card" of those who, like the writer, pin their faith to administrative measures for the control of smallpox rather than to our half-and-half system of incomplete infantile vaccination. We shall revert to this aspect of the question in the final chapter in considering the future outlook.

CARDIFF

The following particulars are taken from a special report by Dr. E. Walford, the Medical Officer of Health, on an outbreak of smallpox in Cardiff in 1903. The total number of cases notified was sixty-five, and for convenience of description they are divided into numbered groups, only some of which need be referred to here.

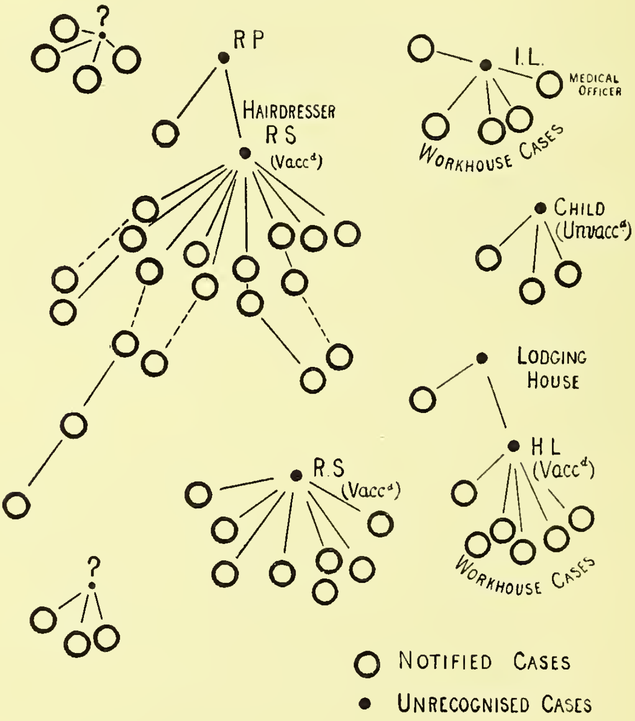
Group i.—The first case in this group was a man, I. L., who was an inmate of the Workhouse for two days. He was not at the time recognised as having smallpox, but was subsequently discovered to have had the disease in a very modified form. He infected four other inmates and a medical officer. No statement is made as to whether I. L. had ever been vaccinated, but we may assume that he had been. Another series of cases at the Workhouse was also due to an unrecognised case, H. L., vaccinated in infancy, who was admitted to the Workhouse on February 8th, but was only discovered to be suffering from smallpox on March 2nd. He infected six other cases in the same ward. It may be added that this man, H. L., was a tramp, and had been infected at a common lodging-house, very probably from an unrecognised case there.

Group iii.—Three cases of smallpox were discovered in one house, the source of infection being a child who had recently suffered from an attack supposed to have been chickenpox. As this child happened to be un-vaccinated the fact is duly recorded. This appears to have been the only instance in the whole outbreak in which an unrecognised case occurred in an un-vaccinated subject. As was the case at Leicester, however, only a mild type of disease was transmitted, each of the three persons infected having discrete attacks, and all recovered.

In the case of this particular un-vaccinated child, moreover, we are told " there were strong grounds for believing that the child was infected from other undetected cases in the same street," and these in their turn were infected by a sailor. Again there is no statement as to vaccination, but we may conclude, I think, that the cases had been vaccinated.

Group iv.—A dock policeman, age 52, vaccinated in infancy, was found to be suffering from the disease in a severe confluent form. On examination it was discovered that three other members of his family—his wife and two sons, aged 14 and 16—had evidently recently suffered from smallpox in a modified form. Again we are not informed as to the vaccinal condition of these three patients, but presumably they had been vaccinated in infancy. In addition to infecting their father, as already stated, one of the sons *was engaged at a hairdresser's shop, and assisted in shaving the customers.* He infected, amongst others, the hairdresser himself (a man aged 24, vaccinated at the age of 7) who also had a very slight attack. The hairdresser also took no notice of his illness and *continued at his business as usual.*

DIAGRAM X



Smallpox in Cardiff, 1903

Disastrous Effect of Unrecognised Cases.

He was accidentally discovered a fortnight later and removed to hospital. In the meantime, however, he had infected eleven other cases, all persons who were in the habit of visiting his shop. These in turn gave rise, it was believed, to eight further cases which occurred. I wish to emphasise the fact that had the hairdresser been un-vaccinated it is extremely unlikely, if not impossible, that such an occurrence could have happened.

Group vi.—The first case in this group was also an unrecognised one, but in this instance the man, a bootmaker, had not consulted a medical man, and was only discovered to be suffering from smallpox when the eruption was eight days old, by which time he had infected nine other persons living in his immediate neighbourhood. It is not stated in the report whether this man had ever been vaccinated, but we may safely assume, I think, that he had been. When smallpox attacks un-vaccinated men, it almost invariably makes them so ill that they are obliged to call in a doctor. This is the case even when the attack is a comparatively mild one.

This bootmaker had himself been infected by a lodger whose illness was undetected at the time, but who was subsequently found to show obvious signs of having recently recovered from smallpox. Again we are not informed whether this lodger had ever been vaccinated or not.

Dr. Walford, however, quite admits the part played by vaccination. On page 11 of his report we read as follows:

" It has been frequently observed that a considerable danger of spreading smallpox occurs from those attacked with the modified form of the disease and amongst whom the constitutional and local symptoms are so slight that the nature of the illness is not recognised either by themselves or by the medical man called in to attend them. In such cases no precautions against infection are taken, and such persons go about their work as usual after perhaps remaining at home for a day or two. . . . *These modified cases usually occur amongst those in whom the protective power of vaccination has partially expired* through age; sufficient power of protection remaining to prevent a severe attack, but not sufficient to confer complete immunity " (italics added).

The experience of practically every town where outbreaks of smallpox have occurred tells the same tale as to the mischief done by unrecognised cases. It would be wearisome to multiply instances unduly. The point, however, is of such far-reaching importance and has hitherto received such scant attention, that I am giving the experience of a number of other towns—Bristol, Manchester, Salford, Newcastle-upon-Tyne, Nottingham, Oldham, Bootle, Leeds, and Glasgow—in Appendix VI.

CHAPTER VII

THE LEICESTER EXPERIMENT

(*a*) THE MOVEMENT AGAINST VACCINATION

McVail on "Leicester's Gigantic Experiment"—Misapprehensions as to the Experience of Leicester—Prof. Berry's "Incontrovertible" Facts—History of the Movement against Vaccination—Prosecuting Campaign — Great Anti-vaccination Demonstration — Emphatic Warnings—Leicester and the R.C.V.—Leicester Guardians and the L.G.B.—Writ of Mandamus.

THE town of Leicester has played so important a part in the movement against vaccination, that this question is seldom discussed without reference being made to the case of Leicester. When the people of the town first rebelled against the vaccination laws (in the early eighties) and practically abandoned infantile vaccination, it was freely admitted that this rash course, if persisted in, would constitute a valuable test of the necessity or otherwise for infantile vaccination. The late Mr. Ernest Hart, Editor of *The British Medical Journal* and author of *The Truth about Vaccination*, and a strong advocate of compulsory vaccination, described it as "*Leicester's Gigantic Experiment*"; and Dr. J. C. McVail, in his classical work, *Vaccination Vindicated*, published in 1887, referring to the attitude of Leicester, wrote: "The anti-vaccinators of Leicester . . . having to a great extent thrown off the armour of vaccination, are waging a desperate and gallant, though misguided, conflict against the enemy. . . . But . . . in Leicester, when its time arrives, we shall not fail to see a repetition of last century experiences, and certainly there will afterwards be fewer children left to die of diarrhœa. It is to be hoped that when the catastrophe does come, the Government will see that its teachings are duly studied and recorded. . . . Leicester has had little chance of getting its 'immunity' tested. When another great outbreak occurs among the susceptible population of England it will be time enough then to see how Leicester comports itself under the ordeal."

It is now twenty-seven years since the above was written. During that period several serious outbreaks have occurred in England, and smallpox has three times visited Leicester in epidemic form. When the first epidemic occurred in 1893, the outbreak was duly reported upon for the Government and the Royal Commission by Dr. Coupland, who was constrained to admit that the facts given in his report "would seem to show that in this epidemic, at least, the natural liability to smallpox, unaffected by vaccination, was not so great as has been supposed." There have been two other epidemics of smallpox in Leicester since then, but the Government have not thought it worth while to issue any further reports.

Misapprehension as to Leicester's Experience

It seems a pity, however, that the lessons to be learned from Leicester's bold experiment should not be "duly studied and recorded," even though they do not happen to have turned out to be quite what McVail and other pro-vaccinists so confidently predicted.

There is the more reason for this, as much misapprehension exists as to what has been the actual experience of Leicester. Many people appear to think that, owing to some extraordinary good luck, smallpox has never come to Leicester in a fatal or epidemic form since vaccination was abandoned, and that consequently the "Leicester Method" has never yet been really tested. Such people still believe that it is only a question of time before the inevitable conflagration occurs.[1] Again and again has this argument been urged: "Only wait long enough and retribution will surely follow." There is no doubt that these predictions have been made in all sincerity. According to orthodox theories a disastrous, widespread, and fatal epidemic of smallpox ought to occur as soon as the proportion of un-vaccinated persons in the population has become great enough, and the necessary "spark" has been introduced. At first it was urged that the large proportion of once-vaccinated persons saved the town, the number of the un-vaccinated being too small. Then it was said that the number of un-vaccinated persons was not nearly so great as had been represented;[1] that whenever smallpox appeared the people all flocked to get vaccinated; and that Leicester people got vaccinated privately without the fact being recorded.

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[1] A medical man, writing to a provincial paper, deploring the subject of vaccination in his town, said, "So fearful am I of the consequences of allowing the accumulation of such a large amount of vulnerable material, in the shape of so many un-vaccinated children, that I would fail in my duty to the public if I did not take this opportunity of voicing the opinion that we are preparing for a terrible day of reckoning—that an awful Nemesis will one day overtake us."

Prof. Berry's "Incontrovertible Facts" about Leicester

On the other hand some people appear to have the impression that the disaster, so often foretold, really has overtaken Leicester. A flagrant example of this occurred a few months ago in a letter written by Dr. R. J. A. Berry, Professor of Anatomy in the University of Melbourne, to *The Melbourne Argus*, under the title of "Smallpox and Vaccination: Fighting an Awful Scourge." Although the letter claimed to be impartial, as being written by one who "could not possibly be accused of any ulterior motive," it was really an extreme pro-vaccinist presentation of the case for making vaccination compulsory in Australia. Moreover, it was written at a time when a great vaccination "scare" had been manufactured on the strength of the occurrence in Australia of a considerable number of cases of smallpox of such an extraordinarily mild type that not a single death had occurred, in spite of the large number of un-vaccinated persons in the population. Dr. Berry, in the course of his letter, referred to the case of Leicester in the following remarkable paragraph:

"The civic rulers of Leicester, in compulsorily vaccinated England, recently defied the law, and abolished vaccination from their midst. All went well for a number of years—smallpox was in one of its well-known quiescent moods; the 'anti-vaccinator,' the 'conscientious faddist,' and 'the criminal idiot who made

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[1] "Leicester is not a particularly un-vaccinated town. . . . As Leicester infants are not, according to the published returns, vaccinated to any extent, the population must get vaccinated later, probably when smallpox threatens. This seems to be the Leicester method. . . ." (Dr. Davis, *Bristol Health Report*, 1903, p. 28).

Leicester's laws' triumphed exceedingly. 'Vaccination was a thing of the past, a gigantic error, and a fraud!' Suddenly outraged nature arose, and, in her wrath, took a terrible revenge, not on the vaccination-scoffing aldermen and councillors of the Borough of Leicester, but on the innocent children of 'ye ancient towne.' Smallpox came down on Leicester like Byron's 'wolf on the fold,' and swept out of existence two-thirds of Leicester's children! In an adjacent vaccinated town, where rulers and citizens alike very properly insisted on all children being vaccinated, the death-rate during the same epidemic, amongst their vaccinated children, was 2·8 per cent., as against Leicester's 66·6 per cent. Can the fathers and mothers of Australia really hesitate in their choice? Facts like these—and they cannot be controverted—should bring home to every Australian citizen that . . . to have an un-vaccinated man, woman, or child in our midst is to incur the risk of suicide and moral murder." [1]

History of the Movement against Vaccination in Leicester

What then are the real facts about Leicester with regard to vaccination and smallpox? [2]

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[1] In the face of such a travesty of the true facts about Leicester I felt constrained to send a letter to *The Melbourne Argus* stating what Leicester's experience really had been. Prof. Berry replied to this saying that a printer's error had occurred, and that "two-thirds of Leicester's children" should have read "two-thirds of Leicester's *smallpox* children." Even so, however, the figure is incorrect and in any case it scarcely makes the misrepresentation less serious, though I have no doubt that Prof. Berry sincerely believed that what he wrote was true.

[2] I would refer those desirous of reading the full history of Leicester's part in connection with the vaccination controversy to a recently published book, *Leicester: Sanitation versus Vaccination*, by Mr. J. T. Biggs, who was for many years a member of the Sanitary Committee of the Leicester Town Council, and who has played a leading part in the local agitation against vaccination.

Although differing *in toto* from Mr. Biggs's view as to the uselessness of vaccination in protecting the individual, I can recommend this book so far as the historical part of it is concerned. It contains an exhaustive record of the anti-vaccination movement in Leicester, such as will not be found elsewhere, and I have not hesitated to make use of it as regards the historical portion of this chapter.

Much interesting information about Leicester is also given in the Fourth Report, and in Appendix IV. to the Final Report, of the R.C.V., and these also I have made free use of.

Prior to the great epidemic of 1871–2 Leicester ranked as a fairly well vaccinated town, though it is true, as McVail has recently pointed out,[1] that prior to 1868 there had been a certain amount of vaccination default in Leicester, as was also the case, no doubt, in most other towns. From 1849 (which is as far back as our records go) until 1871, whilst the births numbered 61,084, the registered vaccinations numbered 41,497, or 68 per cent. During the four years, 1868–71, they amounted to no less than 87 per cent., the infant deaths, of course, accounting for a good deal of the deficiency. The Medical Officer of Health for Leicester, Dr. Crane, in his *Annual Reports* for 1869–70, congratulated the authorities on the "well-vaccinated" condition of the town, stating that infantile vaccination had been "sedulously attended to," and he attributed the freedom of the town from smallpox to this cause.

In July, 1868, the first vaccination officer (Mr. Maskell) was appointed, with the object of enforcing the provisions of the Vaccination Acts more stringently, and the effect of his appointment was soon apparent. On January 15th, 1869, William Johnson was fined 20*s.* or fourteen days' imprisonment for refusing to have his child vaccinated, and he went to prison. In March of the same year Joseph Smart also went to prison for fourteen days. It was at this time that a League was formed in Leicester in opposition to the compulsory law.

Then, in 1871–2, came a very serious smallpox epidemic, part of the pandemic which was affecting almost all Europe. In spite of Leicester's supposed "well-vaccinated" condition, great numbers of the population were attacked, and no less than 358 deaths occurred.[2] The highest previous number since the registration of deaths had been in operation was 164 in the year 1845.

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[1] Article on Vaccination in *The Practitioner's Encyclopædia of Medicine and Surgery*, 1912.

[2] I quite believe that if there had been fewer un-vaccinated persons in Leicester in 1871–2, the toll of deaths would have been smaller, and also that it would have been greater had there been more un-vaccinated, but I think it must be admitted in the light of the experience of Warrington, Sheffield, Middlesbrough, and other towns, that there would still have been a serious epidemic, no matter how thoroughly infantile vaccination had been carried out. The fact is, as we have already seen, that infantile vaccination alone, in the absence of modern sanitary measures, is quite

Following the epidemic of 1871–2 an attempt was made in Leicester, as in the country generally, to enforce vaccination still more stringently. The Guardians pursued such a vigorous policy of compulsion that the number of prosecutions grew from only two in 1869 to no less than 1,154 in 1881.[1] Meanwhile, the opposition to vaccination grew proportionately. Much popular indignation was aroused by the prosecutions, and those who were penalised for defying the law were regarded as martyrs. The Leicester Anti-vaccination League took full advantage of the popular feeling thus aroused, and many, who at first were merely opposed to compulsory vaccination, were easily converted to disbelief in vaccination altogether. Active steps were taken to defend defaulters in the police-court, and protest meetings were held whenever distraint sales took place. The question of vaccination became the question of the day, and was freely discussed at debating societies.

Leicester M.P.'s and the Anti-vaccination Movement

Amongst those who rendered the cause of anti-vaccination good service may be mentioned Dr. P. A. Taylor, [2] M.P. for Leicester

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insufficient to protect any community from smallpox. On the other hand, modern preventive measures with little or no assistance from infantile vaccination have proved sufficient to effectively control smallpox and to prevent devastating epidemics.

[1] "The Guardians utilised every opportunity afforded by successive Acts of Parliament to enforce the law, and continued their prosecuting policy until by 1886 no fewer than between 6,000 and 7,000 parents had been summoned. Sixty-four of these parents were imprisoned, suffering terms of imprisonment ranging from seven to thirty days; 193 distress warrants upon household goods were issued and carried out with great difficulty to the authorities, with rioting and disturbance; while no less a sum than upwards of £2,388 was paid in fines and costs by the persons proceeded against, and the loss of their time attending the courts would more than equal this amount. Amongst those who were prosecuted were ministers of religion, medical men, members of the Town Council and Board of Guardians, schoolmasters, and, indeed, persons in almost every position of life" (Extract from a Memorial to the Local Government Board from the Leicester Guardians, May 2nd, 1899).

[2] In 1871 Mr. Taylor became a member of the Select Committee on Vaccination and signed the Committee's Report in favour of compulsory vaccination. In 1879, however, he stated in the House of Commons that his views had been so far modified that he could not then have put his name to the Report. He added: "I maintain that all the elements justifying compulsion on the part of the State are wanting in this instance of

from 1868 to 1884, and Mr. J. Allanson Picton,[1] who succeeded him in the representation of the borough.

Successive M.P.'s for Leicester and the neighbouring divisions of Leicestershire have almost all followed Messrs. Taylor and Picton's example in their attitude towards vaccination—effective testimony to the popular strength, though not necessarily to the scientific soundness, of the movement against vaccination.

Meanwhile the Guardians continued their campaign of coercion, and in the two years, 1881–2, the number of parents proceeded against amounted to over 2,000. In these years the question of vaccination began to be a test one at the elections for the office of Guardian, and a number of Guardians were elected who had pledged themselves to vote against the prosecuting policy of the Board. In January, 1883, the Board declined, by fourteen votes against eight, to authorise the vaccination officer to apply for distress warrants against defaulters; and in July a resolution to renew prosecutions was again defeated. In October, however, after an exciting debate, a resolution authorising prosecutions was carried by the casting vote of the Chairman, sixteen voting on either side.

The immediate result of this historic vote was that the vaccination officer was authorised to take proceedings against 996 persons who were defaulters under the Acts.[2]

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vaccination." Thereafter he appears to have been unwavering in his hostility to vaccination and in his support of the anti-vaccination movement.

[1] Mr. Picton served as a member of the Royal Commission on Vaccination, and was jointly responsible with Dr. Collins for the Minority Report.

[2] "The result of these prosecutions was to send 21 parents to prison: the sale of household goods distrained from 86 homes, amidst great disturbance and riot, necessitating the presence of a large police force under the chief constable, for the maintenance of the public peace; whilst nearly the whole of the remainder paid the penalties imposed by the magistrates, only 82 out of the total of 996 reluctantly allowing their children to be vaccinated under the pressure of the law" (Memorial from the Leicester Guardians to the Local Government Board, Oct. 1884).

At this time there happened to be two cases of smallpox in Leicester—the result of importation—both in vaccinated persons. *The Lancet*, in commenting on the situation which had arisen in Leicester, after mentioning that the "anti-vaccinationists in Leicester now awaiting summonses were said to number 3,000," went on to say that the smallness of "the present epidemic" in Leicester and its "comparative mildness" were results "almost exclusively due to efficient vaccination in other parts of the country"!

Altogether, during the existence of this Board, from 1883 to 1886, no less than 2,274 summonses were issued.

It is stated that the total number of inhabitants of Leicester summoned and brought before the magistrates during the period, 1879–1886, was between 6,000 and 7,000.

The Leicester Guardians probably prosecuted more people than any other Board in the United Kingdom, but so far from securing compliance with the requirements of the law the result was an utter failure.

In 1884 a fresh trial of strength occurred on a motion by Mr. J. T. Biggs that a memorial be submitted to the Local Government Board, and on this motion the anti-vaccinists won by one vote.

The Great Demonstration

The popular agitation against compulsory vaccination continued to gain in strength, until at length it culminated in a great national demonstration held in Leicester on March 23rd, 1885.

Delegates came in force from all parts of the country where the anti-vaccination movement existed, the town held holiday, and big processions were formed and paraded the town carrying banners and accompanied by bands.[1] The weather happened to be fine and the townspeople turned out in force. The pro-

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[1] The following extracts, from contemporary accounts appearing in *The Vaccination Inquirer*, are quoted from Mr. Biggs's book, pp. 108–14:

"The headquarters of the Demonstration were at the Temperance Hall, and long before mid-day it was a scene of intense activity, most of the banners and flags being fitted up there. Of these there were some seven hundred large and small. Many were tastefully designed, and the colours were as various as the inscriptions. Northampton bore witness that 'Compulsory vaccination is a usurpation of unjust power,' and Brighton that 'Truth conquers.' Kent, with its rampant horse and legend 'Invicta,' set 'Parental affection before despotic law,' and demanded 'The repeal of the Vaccination Acts, the curse of our nation,' clinched with the adjuration, 'Men of Kent, defend your liberty of conscience; better a felon's cell than a poisoned babe.' Kettering pronounced for 'Freedom' and Halifax that 'Jenner's patent has run out.' Middleton set on high 'The crusade against legalised compulsory medical quackery'; whilst Oldham called for 'Health and liberty,' and exhorted beholders to 'Be just and fear not,' assuring them, truly enough, 'The price of liberty is eternal vigilance.' Finsbury and Banbury united in the advice, 'Stand up for liberty!' Southwark called for 'Entire repeal and no compromise,' and Barnoldswick for 'Sanitation, not vaccination.' Truro pertinently asked 'Who can bring cessions assembled in the Market Place, where a great meeting was held, the crowd being described as one of the largest ever witnessed in Leicester. Fiery speeches were made by prominent leaders of the anti-vaccinist movement, in the now well-known anti-vaccination phraseology, and a copy of the Vaccination Acts was dramatically burnt in public by Mr. J. T. Biggs.

"Subsequent events proved that this demonstration practically settled the question of compulsion in Leicester. At the election of Guardians in 1886 the principal question before the electors was that of enforcing vaccination. A large majority of the candidates expressed themselves against the principle of compulsion, and with a few exceptions these were returned. The result of the election was seen in the fact that at the first meeting

a clean thing out of unclean ?' Keighley, ever to the fore, said, 'We fight for our homes and freedom.' Earlstown asked for 'Pure blood and no adulteration,' and Lincoln averred, 'We protect our offspring.' Eastbourne advised, 'Cease to do evil, learn to do well.' St. Pancras sent 'Cordial greeting and sympathy to the heroic martyrs of Leicester.'"

Another account reads as follows: "We formed another good resolution—that we would write down all the mottoes—but once again we broke down utterly. Here are some samples, however: 'Those that are whole need not a physician,' 'Keep your children's blood still pure,' 'What you sow you shall also "reap,"' 'Who would be free themselves must strike the blow,' 'Stand up for liberty,' 'Dare to be a Daniel,' 'Liberty is our birthright, and liberty we demand,' 'Oppressive laws make discontented peoples,' 'Rachels are weeping for their children all over the land,' 'The mothers of England demand repeal,' etc.

"Then there were the artistic banners, which would require the assistance of art to bring them before the eye. One of the first was a group well known to thousands of our readers, representing a skeleton vaccinating an infant in its mother's lap, while a policeman grips her uplifted hand—the mother's face being full of agony and the babe's face of infantine unconsciousness, while the skeleton and the officer of the law are grinning with horrid expressiveness—a life-size enlargement of a design by Mrs. Hume. Another fine banner was the medical bubbles which have burst one after the other in the past century or two.

"Perhaps not the least part of the amusement was created by the trolleys and carts containing tangible things, like diseased cows and horses. . . . .

"Other trolleys contained 'furniture seized for blood-money,' showing that the State had effected a compromise, and that somebody was sleeping without a bedstead, and sitting down to dinner (if he had one) without tables and chairs, instead of baby being vaccinated. One trolley appeared to have negotiated the loan of a gallows and scaffold from the county gaol for Dr. Jenner's sole and particular use; and the execution was carried on without the slightest hitch about every twenty yards through some miles of streets, amid strong manifestations of popular approval."

of the newly elected Board notice was given to rescind the order for prosecutions. On May 4th, 1886, this order was rescinded, on the motion of Mr. J. T. Biggs, after a long debate, by twenty-seven votes against eight. Since this decisive vote no attempt has been made to reverse the decision then arrived at, and on the completion of the prosecutions then in progress prosecutions entirely ceased."

"At the third triennial election of the Guardians in 1889 the vaccination question once again monopolised attention. Such was the force of public opinion evidenced by the falling off in vaccinations from 3,730 in 1873, to 332 in 1887, that almost all the candidates voluntarily pledged themselves against compulsion. The votes for candidates opposed to compulsion still further increased from 48,000 in 1886, to over 66,000 in 1889, while those cast for the few advocates of compulsion declined to about 4,500 from 20,000 in 1886."

"In every contested parish excepting one the opponents of compulsion carried their candidates at the head of the poll; and in all parishes, excepting two, where more than one member was required, they carried the whole of the seats. At the first meeting of the new Board notice of motion was given to endorse the previous non-prosecuting policy of the retiring Board. On April 30th, 1889, on the motion of Mr. J. W. Goddard, this policy was once more emphasised by a significant majority of thirty-one votes against three. A number of deputations of ratepayers and others have at various times waited upon the Board, and their representations as to the administration of the law have received the careful consideration of the Guardians."

Such was the position of the question in Leicester in 1891 when the Leicester Board of Guardians presented the memorial (from which the above extracts have been taken) to the Royal Commission on Vaccination. The memorial concluded with this sentence: "The Leicester Board of Guardians wish respectfully but emphatically to declare that in their deliberate judgment the law of compulsory vaccination can never again be enforced in Leicester."

The extent to which the number of vaccinations decreased in Leicester as the result of the agitation described above is shown graphically in Diagram XI. They began to decline rapidly in the year 1882. By 1887 they had fallen to only 10 per cent. of the births, and by 1891 to less than 2 per cent.

Emphatic Warnings

Naturally, the Medical Officer of Health for Leicester, Dr. Tomkins, uttered grave warnings as to the risks which the town was running in thus neglecting vaccination.

In his *Annual Report* for 1886 he wrote: "The sad feature about the whole business is that it is the young children of the town who are growing up in thousands unprotected, and are running a risk to their lives. They have but to come in contact with the first breath of infection of smallpox to at once contract this loathsome disease." And in his report for the following year: "Should, however, the present state of things continue to go on, and 10 per cent. only of the children born are vaccinated, as happened last year, there will have accumulated a sufficient amount of 'inflammable material' to warrant the use of the term 'Leicester experiment' being applied to the town. Whether the present vigilant measures of isolation and quarantine will suffice to successfully deal with any outbreak of smallpox which may then arise only time can prove. One thing is, however, certain, that any of these unprotected children have but to be brought in contact with a breath of infection from smallpox to almost inevitably contract the disease."

No doubt, had the present writer been Medical Officer of Health for Leicester at that period, without the advantage of the experience which has since been obtained, he would have felt as much alarmed at the prospect as was Dr. Tomkins.

Certainly, Dr. Tomkins's warnings were re-echoed by medical authorities all over the country. Dr. McVail has already been quoted. Reference may also be made to an important paper on "Vaccination versus Sanitation" read by Surgeon-Major R. Pringle at the Congress of the Sanitary Institute held at Leicester in 1885. Dr. Pringle claimed to have had very exceptional experience of smallpox and vaccination, having been engaged in the sanitary service in India for twenty years. He said: "It must be allowed that by a system of isolation, including the special treatment of the cases of smallpox, the isolation . . . of suspected . . . cases, the disinfection of houses . . . the town of Leicester enjoys an immunity from epidemic smallpox which, when its unprotected condition is taken into consideration, is most remarkable, and exhibits a proof of what can be done by a Municipal Sanitary Committee . . . in stamping out this most infectious and contagious of the ordinary eruptive fevers.[1] So successful has this system of what I term isolation been, that it is advanced as affording sufficient reasons for rejecting the present scheme of compulsory vaccination. . . ." Dr. Pringle went on to relate his experience of the behaviour of smallpox in India, and mentioned the case of the small town of Muttra, with a population of 44,000, in which, in the year 1863, smallpox carried off 3,500 children in the space of two months. As regards Leicester, he said that the town was still largely protected by vaccination, "but there is no reason whatever why Leicester some day may not be visited like Muttra. When the cases are few the contagion can be stamped out, but this is quite a different thing when the numbers increase. . . . It must be borne in mind when alluding to the success of isolation in Leicester, that it is mainly due to the success of vaccination *outside* the town, which only admits of a few isolated cases attacking the fortifications of isolation almost singly, but if . . . the number of unprotected become greatly increased . . . I question if they will then be successfully defeated. When once the enemy gets into an unprotected town like Leicester, it will, I feel, fully repeat the tales of death and misery I have seen in India."

Leicester and the Royal Commission

We now come to the time of the Royal Commission on Vaccination. We have already referred to the findings of this Commission, but it is only fitting, in speaking of Leicester's part in connection with the vaccination question, to refer to the part the town played in this epoch-making inquiry.

It was on April 5th, 1889, that Mr. Picton, M.P. for Leicester, moved the following resolution in the House of Commons:

> "That a humble Address be presented to Her Majesty, praying her to appoint a Royal Commission to inquire into the working of the Vaccination Acts; also into the condition, as regards the prevalence of smallpox or

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[1] It should be noted that this acknowledgment of Leicester's "remarkable success" was made twenty-nine years ago when the experiment had only been in operation a few years.

otherwise, of any towns or districts in which the Guardians have for two years or more failed to prosecute for refusal to vaccinate, and likewise into the system of compulsory notification, isolation, and quarantine, as carried out in Leicester and elsewhere ; to take evidence as to the present state of scientific and medical opinion on the effects of vaccination ; to inquire into the nature and causes of popular objections to vaccination, where such exist ; and to report whether any change in the law, and, if so, what change, is, in their judgment, desirable."

Mr. Picton gave the House an exhaustive review of events which had occurred since the last inquiry, that of 1871, and referred to the severe epidemic of that year notwithstanding the assurance of witnesses who appeared before that Committee that the administration of vaccination was almost perfect throughout the land. He alluded to England, Scotland, and Ireland, and also to the rejection by the House of Lords of the clause to abolish repeated prosecutions ; and, further, he dealt with the Sheffield epidemic and Dr. Creighton's article on " Vaccination " in the *Encyclopædia Britannica*.

The Member for Leicester proceeded : " Dr. Lawson Tait was not an anti-vaccinist, but, in a paper read at Birmingham in 1882, he said that zymotic diseases were absolutely preventable by securing fresh air, pure water, and abundant light. Many towns had shown what might be done by sanitation to drive away the disease of smallpox. In Leicester for nearly seventeen years they had found that sanitation, compulsory notification of contagious diseases, quarantine, and disinfection were sufficient to guard the town against disease. In 1872 they had a great deal of vaccination in Leicester and a great deal of smallpox ; while in 1888–9 they had scarcely any vaccination and absolutely no smallpox. All his constituents asked was that impartial and experienced men should go down to Leicester and judge for themselves."

In conclusion, Mr. Picton said that he had shown that the Committee of 1871 had its most important recommendation rejected in another place ; that the Committee of that date was not alive to the startling proofs which were afforded by the repeated failures of vaccination to protect society as distinct from individuals ; that a popular uneasiness was growing ; and that to a large extent it was justified by the facts and the official statistics ; that prosecutions were becoming a scandal ; that the Leicester experiment of seventeen years, up to the present time successful, showed that freedom from smallpox did not depend upon vaccination ; and that medical men were not agreed upon the safety of the operation ; and he therefore moved for an inquiry by a body impartially constituted—perhaps legal minds would be best able to weigh the evidence—not with the object of registering any foregone conclusion, but to collate and weigh all the evidence bearing upon the question. . . .

Mr. Ritchie, President of the Local Government Board, said : " The demand of the honourable member for Leicester was for an inquiry. To grant an inquiry would no doubt seem to imply to some extent that there was a doubt as to the efficacy of vaccination. As far as the authorities at the Local Government Board were concerned, no such doubt existed. Every inquiry had demonstrated that vaccination was one of the greatest blessings ever vouchsafed to mankind.

"Still he could not shut his eyes to the fact that, in consequence of the strenuous efforts of the anti-vaccinators to distort and misrepresent facts, and the undoubted impression they were making on the public mind, it might perhaps be desirable to grant an inquiry. . . .

"The Government had, therefore, determined to appoint a Royal Commission, which, among other things, would carefully consider how far sanitary precautions might take the place of vaccination. . . ."

"Dr. Cameron said there was one reason for granting an inquiry which had not been mentioned, and which amply justified the course adopted by the right honourable gentleman, and that was the enormous strides which science had made since the passing of the Vaccination Acts."

(*The Times*, April 6th, 1889, quoted from *Leicester: Sanitation versus Vaccination.*)

The Lancet, April 13th, 1889, referring to the Government's decision to appoint a Royal Commission, observed: "It is about as rational to investigate the merits and value of vaccination as a security against smallpox as it would be to question the utility of life-boats, or Davy lamps, or fire brigades. . . . Those who cannot see the overpowering arguments in favour of vaccination in the facts of everyday experience, in the diminished mortality from smallpox in the community generally since vaccination was established by law . . . will not be readily convinced by a few more or less vivid illustrations or dogmatic conclusions of a new Royal Commission. . . . We . . . will conclude with the hope that the Government will be exceedingly careful in the selection of persons to constitute the Commission. . . ."

The Leicester Evidence before the Royal Commission

The Royal Commission having been appointed, with Lord Herschell as Chairman, the three public authorities of Leicester—the Town Council, the Board of Guardians, and the School Board—each passed resolutions hostile to compulsory vaccination, and appointed deputations to appear before the Commission and present them. The Board of Guardians, being the body chiefly concerned with the question of vaccination, passed a lengthy memorial which has been already quoted from.

No less than forty-seven witnesses from Leicester appeared before the Commission, including the Mayor, ex-Mayor, two medical men, and many of the leading citizens of the town.

Special reference must be made to the evidence of Mr. J. T. Biggs, who appeared before the Commission on eighteen different days. Mr. Biggs's evidence alone occupies over 167 pages of the Fourth Report, in addition to numerous elaborate diagrams and tables of statistics comprising Appendix III., which accounts for another fifty pages.

Altogether the evidence of the Leicester witnesses occupies over 400 closely printed pages, and constitutes the greater part of the Fourth Report of the Commission.

In referring to the case of Leicester in their Report the Commissioners say: "Passing now to a consideration of the effect produced by a notification of cases of smallpox and the steps taken to isolate them, we naturally begin with Leicester. The method there employed in dealing with smallpox has attracted much attention, and is often spoken of as the 'Leicester system.' . . ." (Sect. 480).

They then give full details of the "Leicester Method" and proceed: "At all events, the experience of Leicester affords cogent evidence that the vigilant and prompt application of isolation, etc., even with the defects which were brought to light during the recent epidemic, is a most powerful agent in limiting the spread of smallpox. It is true that the system and the appliances which appeared adequate for some years failed to prevent a serious outbreak in 1892–3. We think its value was none the less real. We shall consider the matter further when we come to review the whole of the evidence on the subject of isolation and notification" (Sect. 486).

Judging from the lengthy and not unsympathetic references made to Leicester and the "Leicester Method" in the Final Report of the Commission, we are justified, I think, in assuming that the evidence from Leicester was not without its effect upon the members of the Commission. At the date of the Final Report, however, the Leicester experiment had only been in operation about twelve years, which might reasonably be regarded as altogether too short a period to be conclusive. It can scarcely be doubted that, had the "Leicester Method" been on its trial for the lengthy period (thirty years) that is now the case, and had it successfully run the gauntlet of three epidemics instead of only one, its effect upon the Commissioners would have been greater still.

The Leicester Guardians and the Local Government Board

Before we take leave of the Leicester Board of Guardians, reference must be made to their last conflict with the Local Government Board. After the retirement of their veteran vaccination officer, Mr. Maskell, in 1899, it became the duty of the Guardians to appoint a successor ; but the Local Government Board having, by their Order of 1898, laid it down that the vaccination officer could institute prosecutions either on his own initiative or by their direct instructions, the Guardians declined to make the appointment. A protracted controversy with the Local Government Board ensued which lasted for nearly six months. A lengthy memorial from the Guardians, setting out the exceptional circumstances of Leicester, was drafted and sent on May 2nd, 1899. The Local Government Board declined to give way, and the result was that they applied to the High Court of Justice for a *writ of mandamus* to compel the Guardians to appoint a vaccination officer. The hearing of the case took place on July 28th, 1899, Mr. Asquith appearing on behalf of the Guardians, whilst the Solicitor-General (Sir R. Finlay) appeared for the Local Government Board. In the event the *writ of mandamus* was granted.

On the return of the Guardians to Leicester a mass meeting was held in the Floral Hall, and although this building was estimated to hold 7,000 persons an overflow meeting had to be held outside.

The famous writ was issued on September 19th, and stated, *inter alia*, "AND WHEREAS WE have further been given to understand . . . that the Local Government Board have expressly required you to comply with the provisions of the Vaccination Acts . . . by appointing a Vaccination Officer for the said Parish, and that notwithstandng such requirement you have absolutely refused and refuse so to do in contempt of US and *to the great prejudice of the health and well-being of the inhabitants of the said parish*, as we have been informed from the complaint made to US by the Local Government Board," etc. (italics added).

The Guardians still remaining obdurate, an "order *nisi* for writ of attachment" was issued against the twenty-six members of the Board of Guardians who voted against complying with the *writ of mandamus*.

Thereupon the Guardians were obliged to give way, and a vaccination officer was duly appointed, those opposed to the appointment abstaining from voting.

The costs of the fight amounted to over £1,400, and were met by public subscription, Members of Parliament being amongst those who subscribed.

The Local Government Board won a technical victory, but they can hardly claim that they did anything to popularise vaccination in Leicester or to diminish the bitter prejudice against it. In my opinion it is this prejudice against vaccination rather than the neglect of it which constitutes Leicester's real danger, for it is likely to be a great stumbling-block and cause great difficulty should a serious need for emergency vaccination ever arise.

Following the appointment of a fresh vaccination officer, prosecutions, which had entirely ceased in Leicester for fifteen years, were resumed at the instance of the Local Government Board. Since then (to end of 1911) the number of persons proceeded against has been 344, of whom 318 were fined. The distress warrants issued have numbered 51, but none of these have been executed. Ten warrants of commitment to prison have also been issued, but only two operated, these being against Mr. J. H. Bonner, the present Lecturer and Organiser to the National Anti-Vaccination League, who went to prison for seven days, and whose release was of course made the occasion of a further demonstration.[1]

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[1] Mr. J. T. Biggs, in his book *Leicester : Sanitation versus Vaccination*, from which many of the above facts relating to Leicester have been derived, concludes this part of his subject as follows :

"But what a significant condition of things these facts reveal ! There are actually fifty-one distress warrants and eight commitment warrants—in all, fifty-nine warrants—not executed, and not even intended to be proceeded with. What a preposterous farce ! Where vaccination default is concerned, the King's Writ does not run in Leicester !

"So it amounts to this : The Local Government Board has imposed a Vaccination Officer on the Guardians ; obliged them to pay his salary ; instructed him to prosecute, independently of and contrary to the wishes of the Guardians ; won the legal case where his power was challenged ; again instructed the Vaccination Officer to prosecute ; he successfully prosecutes, and defaulters are fined ; the fines remain unpaid ; distress warrants and commitment warrants are issued to terrify the recalcitrants ; the said warrants rest harmlessly in the pigeon-holes of the police offices ; the children remain un-vaccinated ; and there the matter ends ! What a great and glorious triumph for the Local Government Board ! ! ! The Vaccination Acts are completely ignored, and are virtually repealed here in Leicester !

" Why not repeal them altogether ? The fact is, the authorities are heartily sick of the whole business, and would be glad and really delighted to be relieved entirely from the hateful and obnoxious duties imposed upon them by the Vaccination Acts."

CHAPTER VIII

THE LEICESTER EXPERIMENT (*Continued*)

(*b*) RESULTS

History of Smallpox in Leicester—The Great Epidemic of 1871–2—Why the Disease Spread—Dawn of Sanitation in Leicester—Ald. Windley Appointed Chairman of Sanitary Committee—Effect of Sanitation upon Smallpox—Statistics of Smallpox Epidemics in Leicester—The "Leicester Method" of Dealing with Smallpox—Surveillance of Contacts: Quarantine: Searching for Contacts: Vaccination and Compensation of Contacts—Chief Inspector Braley—The Epidemic of 1892–3—Effect of Unrecognised Cases—Outbreak in the Fever Hospital—The Epidemic of 1902–3—The April "Flare"—How the Situation was Saved—The Epidemic of 1903–4—Fatality of Smallpox in Leicester Compared with Other Towns.

History of Smallpox in Leicester

HAVING related the history of Leicester with regard to vaccination, we will now proceed to study its history with regard to smallpox.

The records of smallpox mortality in Leicester go back to the time when the official registration of causes of death in this country was first instituted.

In Diagram XI[1] we obtain a graphic view of the annual smallpox mortality from the year 1838 onwards. We see that formerly Leicester suffered from frequent severe epidemics, but one is struck with their remarkable disappearance since 1872.

So insignificant indeed do the black pyramids appear during the past forty years, that they will scarcely be thought to represent epidemics.

The striking drop in the vaccination curve during the same period indicates the abandonment of infantile vaccination in Leicester.

Taking the average smallpox mortality for the thirty-eight years, 1876–1913, since the passing of the Public Health Act, we find it is an insignificant 1·0 per 100,000 as compared with 41·2 per 100,000 for the preceding thirty-eight years, 1838–75.

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[1] Constructed from the figures given in Appendix V.

From 1838, when death registration began, until 1862, epidemics of smallpox, although recurring every few years, had been gradually becoming less serious. In 1863 the Medical Officer of Health, Dr. J. Moore, in congratulating the town on having been free from epidemic smallpox for several years, attributed the fact "to the well-working of our vaccination system" and stated that as the result of house-to-house inquiries it had been found that "there were very few cases of children who had not undergone vaccination." The very year following this optimistic opinion, however, a severe epidemic occurred—the worst for nearly twenty years—and resulted in 104 deaths. The vaccinal condition of twenty-eight of these fatal cases was not ascertained, but of the remainder thirty-seven were reported as having been vaccinated, and twenty-nine as un-vaccinated.

The outbreak had originated in a common lodging-house, and thence spread all over the borough. Dr. Moore stated that the densely populated parts of St. Margaret's parish had suffered much more severely than the rest of the town.

In 1858 Dr. Moore had suggested the desirability of providing some sort of hospital accommodation for the treatment of smallpox,[1] and he repeated this suggestion in 1865 in his report on the smallpox outbreak of the previous year.

Following the epidemic of 1864, the borough again remained

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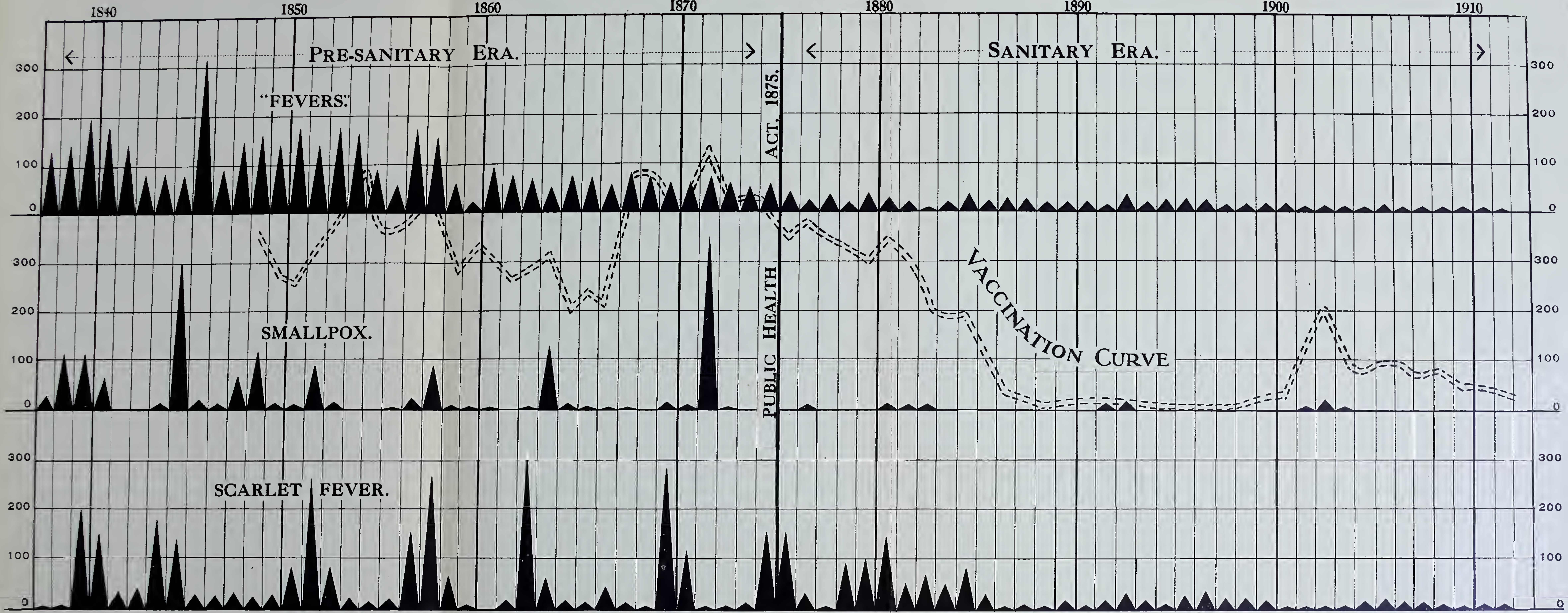
[1] "My attention has been directed to the painful position in which families or large establishments are placed, when this disease makes its appearance amongst them, and of which they only can judge who have witnessed it. One of the difficulties experienced is the inability to procure the necessary attendants where the nature of the disease is known; but another, and the principal difficulty, arises from the absence of means for preventing its extension. The regulations of the Fever House will not allow of the admission of cases of smallpox, and there is at present no local institution of any kind to which a case could be removed. It is, therefore, deserving of serious consideration whether some rooms or building might not be provided, either under the same management as the Fever House, or under some other local government, for the reception of cases of smallpox. Such an establishment would be of great benefit to the town, not only in families who, from their poverty, are compelled to have several persons sleeping in the same room, but in others, where the removal of first or early cases might prevent a great amount of disease, suffering, and loss of life" (*Annual Report for Leicester*, 1864).

DIAGRAM XI.

LEICESTER MORTALITY FROM "FEVERS," SMALLPOX AND SCARLET FEVER, 1838-1912, PER 100,000.
CONTRAST BETWEEN "SANITARY" AND "PRE-SANITARY" ERA.



"Fevers" include Typhus, Typhoid and Simple Continued Fever. Vaccination Curve indicates Vaccinations per 500 Births.

very free from the disease for several years; and in his reports for 1869 and 1870 Dr. J. W. Crane, who had succeeded Dr. Moore as Medical Officer of Health, congratulated the town on its freedom from smallpox, which he also attributed to vaccination, which, he stated, had been "sedulously attended to."[1]

The Great Epidemic, 1871–2

Once again this confidence in vaccination as a safeguard against epidemic smallpox was destined to be rudely shaken. In 1871 an epidemic began, and by the end of the year the disease was widely disseminated throughout the borough, twelve deaths having already occurred. In the following year, 1872, the disease raged practically unchecked, and the deaths numbered 346!

It will be well to consider the position of the town at this time as regards measures for dealing with smallpox apart from the practice of infantile vaccination.

In the first place there was, of course, no notification of smallpox, and therefore the authorities had no reliable means of getting to know of the existence of the disease, even if they had been in a position to make use of the information. Although the town had a population of nearly 100,000, the sanitary staff consisted of two policemen (one an elderly man, not very active) without special training in sanitary work, and having other important duties not now usually imposed on sanitary inspectors in large towns. I am informed that they had to supervise the removal of house refuse, the emptying of privies and cesspools, etc. It is quite certain that they had little time to devote to infectious-disease work. The Medical Officer of Health was an old and somewhat infirm general practitioner who was also physician to the General Infirmary. How much time he was able to devote to his duties as Medical Officer of Health I do not know, but it is quite obvious that during epidemic times his hands would be quite full with his other work. His annual reports consisted of a few short pages, and he only thought it necessary to devote a single paragraph of about twenty lines to the great epidemic—the worst on record—which we are now considering. I have not discovered any further record of this most important event in Leicester's smallpox history, so have no knowledge as to the vaccinal condition of the 346 deaths from smallpox which occurred. Dr. Crane mentions, however, that the deaths in the "hospital" were approximately one-eighth of the cases treated there, or, say, 12 per cent., and on this basis he calculates that the total number of cases occurring during the epidemic was about 3,000.

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[1] Dr. Crane took the opportunity of quoting from a Manifesto which had just been issued by the Royal College of Physicians, wherein it was stated that "nothing in the history of Vaccination, since its first introduction, had occurred to shake the confidence of every well-informed physician," etc. The Manifesto admitted that "smallpox does sometimes occur in those who have been vaccinated, and more especially in those in whom the operation has been imperfectly performed." It was also stated that when such cases did occur, provided they had been *properly* vaccinated, the case-mortality amounted to less than 1 per cent.!

During 1871 Dr. Moore's suggestion to provide a smallpox hospital had been acted upon, and a "hospital" of some sort had been provided in Friars' Road, a large private house with a warehouse at the rear being adapted for the purpose. Friars' Road was in a densely populated area which has since been cleared away. The influence of this hospital upon the neighbourhood can be imagined—even apart from the question of aerial infection—by the following little anecdotes which have been related to me. On one occasion a smallpox patient, thinking he would like a drink, left the hospital and visited a neighbouring public-house. Here he was recognised by the landlady, owing to the eruption on his face, and the hospital staff were informed, but the poor woman paid the penalty by contracting the disease herself. Fortunately she recovered, and is still, I believe, alive. Another story is that of a police constable who went courting one of the nurses at the hospital, and he contracted the disease. It is not very surprising, perhaps, that the hospital failed to become popular with the class it was supposed to benefit, and Dr. Crane laments that persons affected with the smallpox had a strong objection to being taken there. To this cause he attributed the failure of the hospital to check the spread of the epidemic. Probably such a hospital, in such a situation, would be of little, if any, real value.

Towards the end of the epidemic another and better institution was provided on Freak's Ground on the outskirts of the town, but not far from a populous neighbourhood known as Newfoundpool. It was not in time to be of much use during this epidemic, but served fairly well during the epidemic of 1892–3, after it had been cleared of scarlet-fever cases.[1]

Taught by this time not to be too sanguine about the future, Dr. Crane concludes his brief reference to this epidemic, by making the following forecast: "Taking former experience as our guide, we may indulge, I think, a well-grounded hope that five or six years at least will elapse before another epidemic of smallpox occurs in Leicester."

Dawn of Sanitary Era in Leicester

It has often been said that the darkest hour is before the dawn, and so it proved in this case. Hitherto, sanitation, as we at present understand the term, was almost unknown in Leicester, as was also the case in most rapidly growing industrial centres. The condition of the town may be judged from the fact that the general death-rate for the five years 1867–71 averaged 26 per thousand, whilst the zymotic death-rate averaged over 6 per thousand. The town bore an unenviable notoriety as one of the worst in the country for infantile diarrhœa, which levied annually a heavy toll of infant lives.

However, a new era was about to set in.

Under the beneficent influence of Edwin Chadwick and other reformers, the sanitary conscience of the nation was at length awakening—in Leicester as much as anywhere. In 1875 the great Public Health Act was passed and Leicester took early advantage of it. In 1877 Mr. Thos. Windley became Chairman of the Sanitary Committee—a position he has held uninterruptedly ever since—and he threw himself whole-heartedly into the work of sanitary reform. Ald. Windley, indeed, has been the moving spirit throughout this long period of thirty-seven years—a truly remarkable record! Sanitation in Leicester has been his life-work, and he has spent himself unsparingly upon it. In 1878 the town obtained compulsory notification of infectious diseases,[2] including smallpox, under a private Act, Leicester being one of the first towns in the country to obtain such powers. The first whole-time Medical Officer of Health, Dr. Tomkins, was appointed in 1885.

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[1] Dr. Priestley, however, traced a heavy incidence of smallpox in the Newfoundpool district to aerial infection from the hospital on Freak's Ground. The hospital was subsequently moved a mile and a half out from the town and again served in the two last epidemics. It is not quite certain that even there it was not responsible for aerial spread of infection in the borough.

[2] The Act was strongly opposed at the time by the medical men in the town.

I will not attempt to enumerate all the sanitary measures and reforms which have since been carried out. Suffice it to say that the general death-rate has been pulled down to just half what it formerly was, the infantile death-rate has also been greatly reduced, Leicester no longer bears a bad name for infantile diarrhœa, and enteric fever has almost disappeared.

The Effect of Sanitation in Leicester upon Epidemic Smallpox

Ever since the dawn of the sanitary era in Leicester, smallpox, though many times introduced from outside, has never caused another disaster like that of 1871–2. There have been at least forty separate importations of smallpox since the disease was made notifiable in 1878, but only three times has it succeeded in assuming epidemic proportions. Moreover, each of these three epidemics has been trifling, as regards the mortality caused by it, compared with the epidemics of the pre-sanitary era.

The first of these three epidemics occurred in 1892–3, when Dr. J. Priestley was Medical Officer of Health. It resulted in 355 cases with twenty-one deaths, the case-mortality being the low figure of 6·0 per cent.

The second epidemic occurred in 1902–3, a year after the writer became Medical Officer of Health, and it lasted for ten months. It resulted in 394 cases with twenty-one deaths, yielding a case-mortality of only 5·3 per cent. The third epidemic occurred in 1903–4, beginning almost immediately after the termination of the previous epidemic, and lasted for eight months. It resulted in 307 cases with four deaths, the case-mortality being the trifling figure of only 1·3 per cent. At this time several other towns had epidemics of a very mild type of smallpox, but in none was so low a case-mortality recorded as in Leicester.

The figures for these three epidemics, and also for that of 1872–3, are given in tabular form below:

SMALLPOX EPIDEMICS IN LEICESTER

Year.	Population.	No. of Cases.	No. of Deaths.	Attack-rate.	Mortality.	Case-mortality.
1871–2	100,000	(3,300)[1]	358	(33·0)[1]	3·58	(10·8)[1]
1892–3	183,000	355	21	1·94	·11	6·0
1902–3	220,000	394	21	1·79	·09	5·3
1903–4	224,000	321	4	1·43	·02	1·3

It will be noticed that the severity of each succeeding epidemic has been less than the preceding one. It is difficult to regard this as wholly a coincidence. Yet it has been accompanied by an increasing proportion of un-vaccinated persons in the population. Obviously, some factor other than vaccination has been at work, and it is reasonable to suggest that improved sanitation is the most probable cause.

The "Leicester Method"

It will be convenient here to mention what has often been spoken of as the "Leicester method" of dealing with smallpox. It is sometimes objected that there is no longer anything sufficiently distinctive about the method employed in Leicester to justify this term, and it is quite true that those measures—notification, hospital isolation, disinfection, vaccination and surveillance of contacts, etc.—which have proved so successful in Leicester are now generally recognised as essential in dealing with smallpox, and are almost universally practised.

The term, however, has found its way into literature and is frequently made use of by those who are opposed to vaccination; and in any case, when these measures first came into vogue, Leicester was the only town to openly adopt them as a substitute for infantile vaccination. This is the reason, of course, why the "Leicester method" is so often quoted by the anti-vaccinists.

In order to prevent possible misapprehension, let me say at once that the "Leicester method" has never attempted to dispense entirely with vaccination. The latter has always been used to protect the smallpox staff and such "contacts"—*i.e.* persons who have been accidentally exposed to infection—as were willing

[1] Estimated only.

to submit to it. The object has been to use as little vaccination as possible, instead of as much as possible, as would often seem to have been the ideal elsewhere. Under the "Leicester method" vaccination is only resorted to as an emergency measure in the presence of actual smallpox; and the number of persons vaccinated, in any case trifling compared with the total population, is quite insignificant in the case of an ordinary localised outbreak. Usually, the actual inmates of the infected house, together with such persons as have visited the house after the onset of the illness, are the only persons advised to get vaccinated. During the two epidemics since I have been Medical Officer of Health it has not been the practice to trouble even the people next door, provided of course that we were quite satisfied that they had not entered the infected house; nor have I had reason to think this course insufficient.

It need hardly be added that the issuing of sensational posters calling attention to the fact that a case of smallpox has occurred in the town, with the object of working up a "vaccination scare," is *not* part of the "Leicester method." Incidentally, I may observe that this practice is not at all calculated to benefit the trade of a town.

It may also be mentioned that every successive Medical Officer of Health for Leicester has been a firm believer in the power of vaccination to protect the individual.

Surveillance of Contacts.—The control of contacts is now rightly regarded as one of the most important administrative measures in connection with smallpox prevention. Leicester was undoubtedly one of the pioneers in this direction.

At the outset it was thought desirable to remove all contacts from their homes into quarantine, and this has sometimes been regarded as an essential part of the "Leicester method." The whole of the invaded household, as well as the patient, used to be removed to the smallpox hospital, those members of the family who were not actually attacked being isolated until the end of the incubation period in a separate block. Obviously, the number who could be thus accommodated at one time was strictly limited, and in the first outbreak of any magnitude after the "Leicester method" came into being, this method of quarantining entirely broke down and was abandoned. The alternative method of keeping contacts under surveillance at home has been found in practice to be sufficient to prevent infection from spreading. In special circumstances, the quarantine of contacts may be desirable, but proper accommodation, apart from the smallpox hospital, is certainly necessary.

In surveillance at home every contact is visited daily, especially during the latter part of the incubation period when symptoms of the disease may be expected. In special cases it may be desirable to visit twice a day. On the first suspicion of anything being amiss the Medical Officer of Health himself visits, and as soon as a positive diagnosis is made the contact is removed to hospital. As smallpox is rarely infectious before the appearance of the eruption, there is little chance of infection spreading. The success of this measure depends upon the thoroughness with which it is carried out, and it is necessary, of course, to have adequate staff with, if possible, special experience.

Outbreaks of smallpox in common lodging-houses present very special difficulties owing to the unreliable character and wandering habits of the inmates. I consider the wisest course in these cases is to offer free board and lodging at the lodging-house for a fortnight to the remainder of the inmates, together with a cash bonus to all who carry out instructions and remain to receive it. A substantial pecuniary inducement should also be offered to all who are willing to submit to vaccination when this is considered desirable.

Searching for Contacts.—It is most important that no contacts should escape surveillance through not being discovered. A formal inquiry as to the persons who have visited the infected house is often quite insufficient; repeated questioning and cross-questioning will not infrequently elicit the fact that some other person had called who at first had been forgotten. When inquiring as to events which have happened several days or a week before, it is surprising how untrustworthy the memory of the ordinary householder is, especially in the excitement and upset of an outbreak of smallpox!

Vaccination of Contacts.—I regard it as absolutely proven that vaccination, even after exposure to infection, is usually effective, provided that no more than three or four days have elapsed since the infection was contracted. The vaccination of contacts is therefore a very useful and important measure, not only for the sake of the contacts themselves, but also for the sake of reducing the number of cases of smallpox to be dealt with. It can hardly be regarded as an *essential* measure, and I do not consider that any compulsory powers in this direction are either necessary or desirable. It is much less certain in its effect than is vaccination before exposure. In any case the contacts must be kept under surveillance, and in the event of smallpox appearing it is almost always possible, by prompt removal to hospital, to prevent the infection going any farther. Assuming, therefore, that adequate hospital accommodation exists, the vaccination of contacts is not calculated to have much effect upon the continued extension of the epidemic, though undoubtedly it will reduce the number of secondary cases that one has to deal with. I wish, however, to emphasise the point that secondary cases occurring amongst contacts under observation are not the cases which propagate or prolong an epidemic, this being due to the untraced and overlooked cases.

Compensation of Contacts.—In Leicester it is the practice to give half-pay to all contacts so long as they remain away from work and carry out the instructions of the Medical Officer of Health. This arrangement has been found to work very well. Contacts are well aware that their employers will not consent to receive them back at work until all danger of infection is over, so that it is not really a case of staying away from work merely to please the sanitary authority. Contacts are not debarred from going out of doors, but must remain at home each day until they have been visited by a member of the sanitary staff. They are instructed to immediately return home, should they begin to feel out of sorts, and communicate with the Sanitary Office. In practice these precautions appear to be sufficient. As already stated, smallpox is rarely infectious before the rash appears; certainly it is very slightly, if at all, infectious on the first day of the pre-eruptive stage. In the case of a contact out for a walk who begins to feel unwell, there is little inducement to remain away from home until the end of the day, as there would be in the case of a person at work in a factory, and thus the risk of infecting other persons is much less.

Notification of Chickenpox.—This measure has never been adopted in Leicester, nor has the writer had reason to think that it would be of much advantage. Obviously, it can be of little assistance in preventing mistakes in diagnosis unless an expert is sent to check each case notified. In Leicester the medical practitioners are invited to communicate with the Medical Officer of Health on the occurrence of any case in the slightest degree suspicious of smallpox, and this they frequently do whenever smallpox is about. In addition, the elementary schools make a return of all cases of chickenpox, and these are visited by a sanitary inspector.

It is unnecessary to explain in detail the whole procedure followed in Leicester. Speaking generally, it is the same as is now in vogue in all large towns. An excellent account of modern measures for dealing with the disease will be found in Dr. Wanklyn's recently published little book: *The Administrative Control of Smallpox.*

Services of the Chief Inspector.—There is one point, however, in connection with the "Leicester method" which should be mentioned, viz. the special services in connection with smallpox prevention rendered by Mr. Francis Braley, who has been connected with the sanitary staff for over forty years, and has been Chief Inspector for twenty-three years. It would be difficult to overestimate the value of Mr. Braley's services to Leicester. In the hunting up and supervising of contacts he has been invaluable, and he has been the "right-hand man" to each successive Medical Officer of Health. I have no hesitation in saying that much of the success of the "Leicester Method" has been due to his efficient and indefatigable work.

Has the Leicester Method been Adequately Tested?

For many years after the Leicester experiment was begun, it was denied that its results were conclusive, and it was alleged that the "Method" had not been adequately tested. Leicester had been "lucky"; she was an inland town not much exposed to the risk of infection; she was "surrounded by a cordon of vaccinated millions," etc., etc.

As a matter of fact, I doubt if Leicester has derived any appreciable advantage from being surrounded by vaccinated communities. Indeed, I am inclined to think it is the other way about, and certainly it is the imported cases in vaccinated persons which have given the town so much trouble. Leicester has probably suffered quite as much from importations of smallpox as any other large inland town.

We will next consider in detail the three epidemics of smallpox which have occurred in Leicester since the advent of the sanitary era and the abandonment of infantile vaccination.

The Epidemic of 1892–3

At the time this epidemic occurred in Leicester, smallpox was more or less prevalent throughout the country, as was also the case when the other two epidemics occurred. This is shown by the following figures. In 1890 there had been 15 deaths from smallpox in England and Wales. In 1891 there had been 48, the number gradually increasing each quarter. In the first quarter of 1892 there were 76 deaths, in the next quarter 99, then 86, and in the last quarter 165. During this and the following year the disease was repeatedly introduced into Leicester. Dr. Priestley, the Medical Officer of Health, states that there were 11 separate introductions of the disease into the town by tramps, and 13 by ordinary visitors, 24 in all. Therefore it was not unvaccinated Leicester which infected the rest of the country, but the rest of the country which infected Leicester. The case which originated the epidemic was a tramp, William S., aged 35. This man had been vaccinated in infancy, and Dr. Priestley describes his attack as "very mild." There was no secondary fever, his highest recorded temperature was only 99·2, and the rash, which was discrete, aborted. I submit that the mildness of his attack was largely due to his having been vaccinated. I am justified in asserting this, because, although there were a number of un-vaccinated adults who contracted smallpox during the epidemic, not one of these is described as having a mild, much less a "very mild," attack. The consequences, direct or indirect, of the man's attack being so "mild" were disastrous to Leicester, however advantageous to the man himself. It cost the town thousands of pounds besides much loss of life and health.[1]

This man, William S., a vaccinated tramp, came with his wife to Leicester from Derby on August 20th, 1892, and went to live at 3, Court E., Britannia Street, one of the least satisfactory districts in Leicester from a sanitary point of view. The cottage was used as part of a common lodging-house and was also occupied by two other families, the B.'s and the M.'s, seven persons in all. On August 24th, William S. went to the Workhouse, as he was not feeling well and had a few spots on him. He was examined by a medical man, and had the latter recognised the nature of his illness (as no doubt he would have done had the attack been more characteristic) the man would have been effectually isolated, precautions would have been taken, contacts would have been vaccinated and kept under surveillance, and in all probability the outbreak would have gone no farther. Unfortunately the case appears to have been mistaken for chickenpox, and he was placed in the itch ward, which contained eight other persons. The next day, fortunately, he was isolated in an inner room leading out of the itch ward, and five days later he was discharged, there being no sufficient reason, in the opinion of the medical man, for detaining him longer. The man then went to Market Harborough and Kettering, and how many persons he may have infected in those towns, or on the road thither, is not known. He then returned to Leicester, where he was subsequently examined by Dr. Priestley, who came to the conclusion that the few stains on his body were the remains of a modified attack of smallpox.

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[1] Incidentally, he was the cause of untold work, worry, and anxiety to Dr. Priestley, which only the latter, and those familiar with that period of Leicester's history, can appreciate. I wonder if Dr. Priestley has ever reflected that all the trying ordeal he went through as Medical Officer of Health for Leicester during the ensuing months would very probably never have occurred if that man, William S., had never been vaccinated ?

Dr. Priestley writes[1]: "Considering all the circumstances of the case, I am justified in attributing our smallpox outbreak to William S."

I will now follow the movements of the two families, the M.'s and the B.'s. The first remained in Britannia Street for a few days, and then after a trip to Hinckley they returned to Leicester to another house, and Sarah M., who was now beginning to sicken with smallpox, went to the Leicester Infirmary in a cab, and was admitted as an in-patient, being placed in St. Mary's Ward with twenty-nine other patients. The next day, as a suspicious rash had appeared, she was promptly isolated in a special small ward, and thanks to this precaution a serious outbreak at the Infirmary was averted. She was removed to the Fever Hospital the following day. The inmates of St. Mary's Ward were vaccinated and quarantined, and fortunately no further cases arose.

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[1] *Report on Smallpox*, 1892–3.

The other family, the B.'s, removed to Woodboy Street, and there Jane B. was found, on September 10th, to be suffering from smallpox. Neither she nor her baby had been vaccinated, but the baby escaped.[1] It was afterwards vaccinated, which accounts for its not being infected later by its mother. The mother had a very severe confluent attack, and was left badly "pitted."

The same day that Mrs. B. was discovered, a man at the Workhouse, W. H., who had slept in the next bed to William S. on the first night he was there, before he was placed in the inner room, was found to be suffering from smallpox and developed a confluent attack which unfortunately proved fatal. He had been in the Navy, but had no vaccination marks.

Two of these three cases were apparently un-vaccinated, and had very severe attacks, one being fatal. This proves that the type or "strain" of infection introduced into Leicester by the "mild" vaccinated tramp, William S., was very far from being mild. It is important to note this, as it disposes of the suggestion that the reason the 1892–3 epidemic in Leicester was so unexpectedly mild was because a very mild strain of infection had been introduced. If the epidemic afterwards assumed a mild and benignant type, it was not due to the type of infection but (presumably) to local conditions.

Unfortunately, in spite of the greatest efforts of Dr. Priestley to prevent the spread of infection, a further case, Edward K., developed the disease a fortnight later. He had a very thick confluent eruption, but, having been vaccinated, the rash "aborted" and he soon got better. Dr. Priestley was able to trace this case to Jane B. through the medium of infected house refuse. The man was removed to hospital, and his family—most unfortunately as the event subsequently proved—were also removed to hospital for quarantine. The two younger children, who were un-vaccinated, were vaccinated after exposure to infection. Whilst in quarantine at the hospital, the limited accommodation in which was strained to its utmost at the time, they unfortunately contracted scarlet fever and were placed in a ward with a number of scarlet-fever patients. Here one of them developed a slight attack of modified smallpox—modified, no doubt, by the vaccination performed during the incubation period. It so happened that the few spots which appeared were mistaken at first for chickenpox, and the child was accordingly placed for a few days with some children suffering from that disease. The result was that several of the scarlet-fever patients contracted smallpox, and it was decided to empty the hospital as far as possible; a number of the other scarlet-fever patients were consequently sent to their homes in the town, where six of them developed smallpox, and had to be readmitted. Unfortunately three of them infected other members of their families. Public feeling in connection with smallpox and vaccination was running very high in the town and also on the Sanitary Committee at this time, and an inquiry was held into all the circumstances of the hospital outbreak. A special committee was appointed for the purpose, and so prolonged was the inquiry and so voluminous the evidence, which was all taken down verbatim, that it has been jokingly referred to as the "Leicester Royal Commission."

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[1] This contradicts Dr. Tomkins's statement that "un-vaccinated children had but to come in contact with the first breath of infection to at once contract this loathsome disease."

Further cases of smallpox continued to "crop up." Two members of the hospital staff, having declined to be re-vaccinated, contracted the disease, and in one of these—a laundress of intemperate habits—the attack proved fatal. Cases then began to occur in Newfoundpool, a suburb in the neighbourhood of the hospital. Next, a nurse at the hospital—not re-vaccinated, still less recently vaccinated—developed the disease. Then unrecognised cases occurred in the town. One of these was a vaccinated man who had a very mild attack which was not discovered until three members of his family developed the disease. Two of these were un-vaccinated children, one of whom died after a very severe attack during which the sight of both eyes was destroyed—another example of the severe type of disease so often spread by "mild" vaccinated cases. These cases in turn infected others. There were also several fresh importations of the disease into Leicester from a distance.

During 1893 the disease became pretty generally diffused throughout the borough, but all cases continued to be removed to hospital directly they were notified. Altogether, 355 cases occurred with 21 deaths, and the outbreak lasted for 15 months before it was finally suppressed. It was undoubtedly prolonged and greatly aggravated by the occurrence of unrecognised cases and also by the influence of the smallpox hospital, which was situated much too near the confines of the borough. Some 55 cases occurred in Newfoundpool, most of which were probably connected, directly or indirectly with the hospital, through aërial infection. There were six other cases also traceable to aërial infection, and six persons were attacked who had visited the hospital or been in quarantine there. There were also five members of the staff who refused re-vaccination and contracted the disease, and the 13 scarlet-fever patients who were infected in the hospital outbreak referred to above. Altogether Dr. Priestley attributed 85 cases (out of the total of 355) to hospital infection. Yet, in spite of these difficulties, Dr. Priestley, with the assistance of Chief Inspector Braley and the rest of the sanitary staff, was able to prevent the epidemic from assuming really serious proportions.

Had it been any other town than Leicester the outbreak would have received but little notice from outside, but owing to the interest aroused by Leicester's defiance of the Vaccination laws it has been frequently referred to and quoted.

The Epidemic of 1902–3

We now come to the period in the smallpox history of Leicester of which the writer can speak from personal experience. The epidemic of 1902–3 began in December, 1902, and terminated in October, 1903, and resulted in 394 cases, with 21 deaths.[1] It was followed almost immediately by the epidemic of 1903–4, which resulted in 307 cases with 4 deaths. During the year 1902 smallpox was present in epidemic form in London, and this led to localised outbreaks in many provincial towns. During the course of the year the disease was imported into Leicester on seven different occasions, but in each instance the spread of the disease was effectually controlled and only 16 cases resulted. In most of these importations the disease was of a severe type, as is shown by the fact that amongst the 16 cases there were three hæmorrhagic attacks and eight others either confluent or coherent; whilst five of the cases proved fatal. It cannot be contended, therefore, that Leicester's remarkable immunity from a fatal epidemic of smallpox is due to the fact that a fatal "strain" of the disease does not happen to have been introduced into the town. The epidemic of 1902-3 originated—as has already been related in Chapter V.—in an unrecognised case in a tramp at the Workhouse, which led to the infection of 20 other inmates; and in two unrecognised cases outside, which led to 41 other cases. It is unnecessary to repeat the details here.

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[1] The number of deaths happened to be exactly the same as in the previous epidemic, 1892–3.

After the outbreak at the Workhouse had been subdued, and also that in connection with the unrecognised cases outside, it appeared as if complete control of the disease had been obtained. A few odd cases kept occurring, however, which could not be satisfactorily accounted for, and there were about 30 patients still under treatment in the Smallpox Hospital, most of these being convalescent. We were beginning to breathe freely again and to think that all serious danger was over when a remarkable phenomenon occurred.

The April "Flare"

After a fortnight's lull, during which the only cases[1] occurring were some contacts in a house under observation in Ridley Street and an untraced case in a child (not attending school) at Belgrave, a sudden and inexplicable outburst, or "flare," took place. The first warning of mischief was on April 15th (Easter Day was on April 12th), when four cases were reported in different parts of the town. These were followed by two, two, five, and five on the succeeding days. On the 20th, no less than fourteen cases were reported. For the four weeks ending May 14th, the weekly numbers were 53, 21, 34, and 48. Then the "flare" subsided almost as quickly as it had arisen, and six weeks later only a single case occurred in a week.

The *cause* of the outburst has always been a mystery. In the great majority of the cases *no clue whatever* could be obtained to any possible source of infection in spite of the most careful inquiries. Indeed, during the first eleven days, April 15th to 25th, the source of infection was only discovered in a single instance out of sixty-five cases which occurred. In one other case there was a remote clue, and one was imported. The remaining sixty-two cases were absolutely untraced.[1] To simplify the problem we may confine ourselves to these first eleven days.

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[1] It is quite certain that these cases could not have been responsible for the "flare" which followed.

The following are the particulars of the sixty-two untraced cases which occurred during this short period:

Age and Sex Distribution

Under 10 years.	10 to 20 years.	20 to 30 years.	30 to 40 years.	40 to 50 years.	50 to 60 years.	Over 60 years.
M. F.	M. F.	M. F.	M. F.	M. F.	M. F.	M. F.
6 5	9 13	2 5	6 4	1 6	1 3	.. 1
11	22	7	10	7	4	1

There was thus some excess of adult females, but I am quite unable to explain it, and it may be only a coincidence. The same preponderance was noticeable, however, during the remainder of the outburst. Twenty-eight of the cases were vaccinated, thirty-three were un-vaccinated, and one was uncertain. The cases occurred in sixty-one houses in fifty-eight streets, scattered over an area involving the northern two-thirds of the borough.

Thirty-seven of the cases went to work in thirty-two workplaces and factories. Fourteen school-children attended eleven different schools. None of the cases, at this period, occurred in common lodging-houses. Efforts were made to ascertain if the persons attacked had been together in any building or crowd, such as theatre or music-hall, church or chapel, market, etc., or if any person had visited the various houses attacked, but nothing in common could be discovered. The infection, indeed, appeared veritably to have "dropped from the clouds."

So large a number of cases occurring in such a short space of time, without any clue to their origin and with so widespread and impartial a distribution, is very difficult to account for. With our present knowledge there are practically only two theories that would suffice to explain the facts, viz. (1) aërial infection from the hospital, and (2) the occurrence of a number of unrecognised cases.

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[1] In the latter part of the outburst, as might be expected, a certain number of secondary cases arose, traceable to those which had already occurred, but there were still a great many untraced cases. Out of the total of 156 cases occurring in the four weeks, 112 were quite untraced.

(1) The smallpox hospital is situated in a very isolated position one mile to the north-west of the borough. During the time the infection must have been spread, viz. the first ten days in April, the wind was blowing from the north-west (a rather unusual quarter) on 2nd, 5th, 7th and 8th. At this time there were about thirty patients in hospital, most of them convalescent.

The chief facts against the theory of aërial infection are the great distance of the hospital from the town, and the comparatively small number of patients under treatment during the "critical" period. This is not sufficient to exclude the possibility of aërial infection, but I admit that such a theory seems improbable and difficult to believe.

(2) The alternative theory is that a number of unrecognised cases, of a highly infectious type, were going about spreading infection broadcast. But, if this were the true explanation, it seems almost incredible that none of these cases should have left the slightest clue to their existence. At other periods of the epidemic unrecognised cases were frequently discovered.

On the whole, therefore, I am inclined to favour the first alternative, viz. that of aërial infection from the hospital.

Whatever the cause, the April "flare" served one useful purpose. Hitherto it had often been alleged that the "Leicester method" had never been adequately tested, and that Leicester had always been "lucky." This outburst, it must be admitted, afforded a very severe test. In four weeks 157 cases occurred in 128 houses in 103 streets, from some cause or causes apparently quite beyond control, and without warning. If ever the "Leicester method" should have broken down it was then. Few towns during recent years have had to deal with so many cases in so short a space of time. The success with which the disease was stamped out is indicated by the fact that in successive weeks the number of fresh cases dropped from 46 to 22, 14, 10, 4, 2, 1, and a fortnight later none were reported. Even a well-vaccinated town could scarcely have done better.

Such a result seems to indicate that, provided the task of stamping out smallpox is a straightforward one, the "Leicester method" is adequate for the purpose without recourse to universal vaccination.

How the Situation was Saved

As a consequence of the April "flare" we were called upon, in the space of four weeks, to provide hospital accommodation for no less than 157 smallpox patients at the same time. The rapidity with which the cases occurred has already been indicated. The Smallpox Hospital provided accommodation for only sixty patients, and the administrative buildings were not adequate for even that number. In less than a week from the beginning of the "flare," the Smallpox Hospital was quite full.

Had we not been able to continue isolating cases it is quite possible that Leicester would have shared the fate of Middlesbrough, Gloucester, Dewsbury, and other towns where hospital isolation broke down. A widespread epidemic would probably have resulted, much suffering and loss of life would have occurred, the trade of the town would have suffered seriously, and the town would have had to resort to universal vaccination.

Fortunately, however, we were prepared for the emergency. Early in the epidemic, owing to the mischief done by the unrecognised cases already referred to, the accommodation at the Smallpox Hospital had become almost exhausted, and the Sanitary Committee, as a precautionary measure, had emptied (almost at a day's notice) the Borough Isolation Hospital on the Groby Road, sending out some 98 scarlet-fever patients to their homes. By doing this we increased our available hospital accommodation for smallpox by nearly 200 beds, with plenty of room for putting up tents had still more accommodation been required. Consequently, when the April "flare" took place, we at once utilised the empty Groby Road Hospital, and thus had no difficulty whatever in providing ample hospital accommodation for all the cases which occurred. Removal to hospital was promptly effected as soon as a notification was received, the Medical Officer of Health visiting every case personally and confirming the diagnosis. The medical men in Leicester helped us loyally in the way of prompt notification, and would telephone to the Sanitary Office as soon as they had seen anything in the least suspicious.

Nearly all of the sanitary staff, and all the hospital staff, were told off for smallpox duty, and other work was largely omitted for the time being. Fortunately, there was no panic in the town and no scare. There was, of course, an entire absence of sensational posters and placards urging the public to get vaccinated. The local Press assisted the authorities by taking comparatively little notice of the outbreak, and the result was that the trade of the town was practically unaffected. What a contrast this is to the experience of Sydney, New South Wales, during the outbreak in 1913!

The Money Cost of the Epidemic

It is very difficult to state precisely what was the cost of the epidemic to the ratepayers.

The chief item was the expense of treating the smallpox patients in hospital, but as separate accounts are not kept for the different diseases treated it is not easy to determine what extra cost was entailed by the smallpox cases. For nearly six months the Groby Road Hospital was closed to other diseases and reserved for smallpox only. The result was that the hospital expenditure for the nine months ending September 30th (which practically covers the period of the epidemic) was, in spite of the epidemic, only very slightly higher than during the corresponding period of the previous year. There is no reason to think that the borough suffered materially through the temporary exclusion of the other diseases, for during the time the hospital was closed to them, scarlet fever, diphtheria, and typhoid fever were all below the average in prevalence.

Perhaps the fairest way to estimate the cost of the hospital treatment of the smallpox cases is to allow £1 per week per patient, and on this basis the total cost of treating the 377 patients (the mean stay in hospital being 4½ weeks) works out at £1,696.

Another principal item was the amount paid in compensation to contacts for staying away from work, viz. £195.

We must also reckon the cost of vaccinating "contacts" (for nearly the whole of this had to be paid for out of the rates, though not through the Corporation), say £150. If to this we add £200 for sundry expenses (cab hire, gratuities to the sanitary staff for extra work, cost of disinfecting, etc.), we obtain a total of £2,241, representing the direct money cost of the epidemic. This amount is certainly very moderate in comparison with what smallpox epidemics have sometimes cost other towns.

The epidemic was gradually subdued, and the number of patients remaining in hospital became smaller and smaller until only one was left. This patient was discharged on December 5th, 1903, and the hospital was closed. No case had occurred for five weeks, and the epidemic was at an end.

The Epidemic of 1903–4

In less than a week after the closure of the hospital, however, it was again in requisition owing to an outbreak at a common lodging-house in Woodboy Street. It is probable that this was an entirely fresh importation. The first case was the keeper of the lodging-house himself. This man had been vaccinated in infancy and had an attack so mild that no eruption was seen. Consequently, the real nature of his illness was not recognised until his wife and two children were notified simultaneously as suffering from the disease. These cases, not being under observation when they first sickened, infected eight other cases. About the same time the disease was imported into another lodging-house in Britannia Street by a tramp from Nottingham. He appears to have infected an inmate of a neighbouring lodging-house, who sickened with the disease twelve days later. This last lodging-house was a large one, containing at the time about one hundred lodgers, and considerable difficulty was experienced in stamping out the disease. Altogether seventeen of the inmates contracted smallpox, and also a woman who had visited the house.

Before this outbreak was subdued, the disease was again introduced into the borough by a family of tramps, who were believed to have contracted the infection in a lodging-house in Loughborough. The disease was also imported by a man from Nottingham. We then had an outbreak in a lodging-house in Lee Street, but this was confined to three cases.

A little later the disease was again introduced by a tramp from Loughborough, and then by some gipsies who had been travelling about the country. Then came a third importation from Loughborough.

From this time (middle of February) onwards the infection became generalised, and many cases occurred the source of which could not be traced. The epidemic reached its maximum at the beginning of April, when thirty-three cases occurred in one week. It then rapidly declined, and after lingering on through June and July it terminated in August.

The total number of cases was 307, but fortunately the type of the disease was exceptionally mild, and *only four of the cases proved fatal.* During the year 1904 a mild type of smallpox prevailed throughout the country, but it is a remarkable fact, difficult to explain away as being merely a coincidence, that in no other large town where an epidemic occurred was the case-mortality so low as in Leicester.[1]

The statistics for the Leicester epidemics will be found in Appendix V., together with particulars of some of the minor outbreaks which have occurred in Leicester.

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[1] The following table shows the figures for those large towns in which, during 1904, smallpox was epidemic to the extent of 1 per 1,000.

SMALLPOX IN VARIOUS TOWNS IN 1904

TOWN.	Estimated Population.	No. of Cases.	No. of Deaths.	Attack-rate per 1,000.	Mortality per 1,000.	Fatality (Case-mortality) per cent.
Derby ..	120,000	209	3	1·74	·03	1·4
Gateshead ..	118,000	395	34	3·34	·29	8·6
Leicester ..	224,000	307*	4†	1·37	·02	1·3
Newcastle ..	225,000	355	18	1·57	·08	5·1
Nottingham ..	249,000	291	12	1·17	·05	4·1
Oldham ..	139,000	248	14	1·78	·10	5·6
Stockport ..	97,000	155	14	1·60	·14	9·0

* The figure given by the Registrar-General is 297, but this does not include several unrecognised cases only discovered after recovery.

† The number of deaths is stated in the Registrar-General's Summary as *five*, but the correct number was *four*.

CHAPTER IX

THE LEICESTER EXPERIMENT (*Continued*)

(*c*) SOME OBSERVATIONS ON THE EXPERIENCE OF LEICESTER

Prophecies Unfulfilled—A Complete Justification of Policy Pursued—Experience of Leicester Quite Conclusive as to Value of Vaccination in Protecting Individual—The Smallpox Hospital Staff—Effect of Vaccination after Exposure to Infection—Vaccinal Condition of Invaded Houses—Low Mortality of Smallpox in Leicester—Small Part Played by the Children—School Infection—Comparative Immunity of Infants—Influence of General Vaccination—Cost of Dealing with Smallpox in Leicester.

Having now set forth the chief facts concerning Leicester bearing upon the vaccination question, we will proceed to make some observations upon them and to consider the Leicester experience in a little more detail.

In the first place, I think it must be admitted that the broad results of the Leicester experiment have been successful beyond all expectation, and have been very different from what was so confidently anticipated and foretold by pro-vaccinists. There has been no "terrible retribution," no "red terror," no decimation of the population, no appalling catastrophe, no wholesale sacrifice of the helpless "unprotected" little ones. Smallpox, although repeatedly introduced into an un-vaccinated community, has not "spread like wildfire." Leicester has proved, hitherto, just as able to effectively control smallpox as any other large industrial town, not excluding those most efficiently vaccinated. It is surely no exaggeration to say that the results of the Leicester experiment have been a complete justification of the policy pursued of concentrating on "sanitation"—again using that term in its broadest sense—rather than on infantile vaccination.

I should think there are very few medical men in Leicester, familiar with the whole history of this question, who would seriously suggest now that the town ought to revert to the old policy, or that it is really necessary for the safety of the community that all children in Leicester should be vaccinated. If there are any such they have long since ceased to give public utterance to their views.

But whilst Leicester has certainly constituted an object-lesson as to the efficacy of modern methods for dealing with smallpox in the absence of infantile vaccination, it would be quite erroneous to suppose that anything in the experience of Leicester throws the slightest doubt upon the efficacy of vaccination to protect the individual. The opponents of vaccination constantly point to Leicester in support of their contention that infantile vaccination is no longer necessary, but I wish to suggest that those who quote Leicester must be prepared, in common fairness, to admit the evidence of Leicester as a whole, and ought not to reject those aspects of it which do not happen to support their preconceived theories.

I wish to state emphatically, that the experience of Leicester is, in my opinion, *quite conclusive* as to the value of vaccination in conferring temporary immunity on the individual. In Leicester persons recently vaccinated [1] do not take smallpox—however much they may be exposed to infection—any more than is the case elsewhere. Even supposing there had been occasional exceptions, "to prove the rule," it would not have affected the truth of this as a general statement. But as a matter of fact, so far as Leicester is concerned, there have been no exceptions. I speak from personal knowledge of the last thirteen years. This is the more remarkable when it is considered that amongst the recently vaccinated class there have been many who have been exposed to infection more continuously and more severely than any other class of the community—I refer to the Smallpox Hospital staff.

The Smallpox Hospital Staff

The total number of resident staff employed during the two last epidemics, viz. those of 1902–3 and 1903–4, was 74. Every one of these persons (with the exception of three who had already had smallpox) had been recently vaccinated. It was my practice to satisfy myself on this point before allowing any one to commence smallpox duty.

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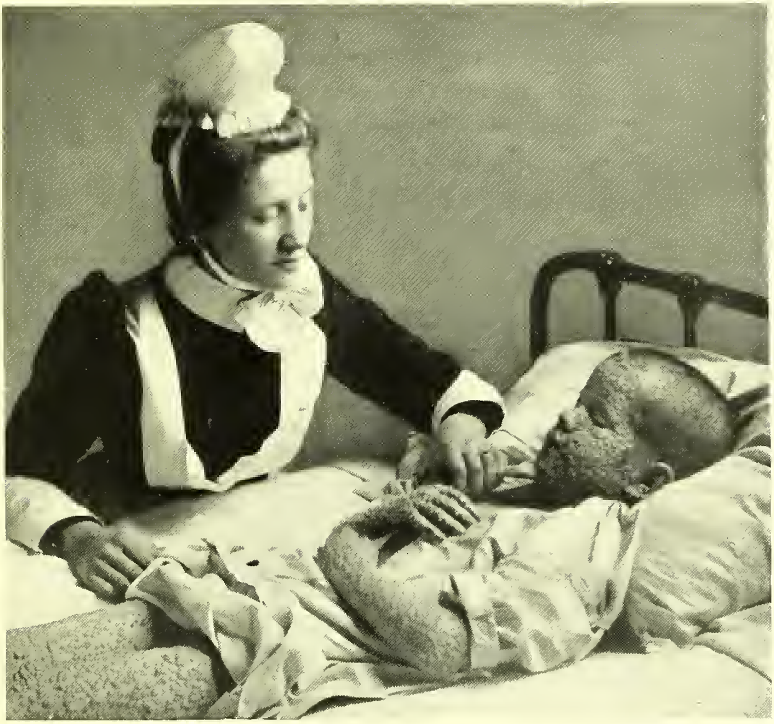
[1] This does not include, of course, persons vaccinated during the incubation period.

All the staff were more or less exposed to infection, but especially the nurses, thirty-nine in number. As I stated in my report on the 1902–3 epidemic, they may be described as having been "literally steeped in infection. They had to wash and feed the patients; to make their beds and change their soiled linen; to dress their sores and cleanse their mouths (often most offensive in bad cases); to collect and burn the scabs (often in handfuls) that are shed by the patients; and, in the event of a fatal issue, to 'lay out' the corpse. Many of them continued on smallpox duty for many weeks at a stretch without a break. Although the health of the staff on the whole was good, there were times, as might be expected from the arduous nature of their duties and the close confinement, when they would feel 'run down' and be specially liable, one would think, to contract any infection. At the outset there was no question of their being 'seasoned' to the disease because most of them (prior to 1903) had never seen a case of smallpox before." Yet although, during the two years, nearly seven hundred cases of smallpox, of all degrees of severity, passed through the hospital, *not a single member of the staff contracted this most infectious disease.* Not one showed so much as a single smallpox pustule.

How is this remarkable immunity in the presence of such severe and continuous infection to be explained?

Surely, the only explanation in the least adequate is that recent vaccination confers protection against smallpox, or, for those who prefer it expressed in another way, there is a "temporary antagonism" between cowpox and smallpox, so that for some time (usually for several years) a person who has had cowpox (*i.e.* been vaccinated) will not take smallpox.

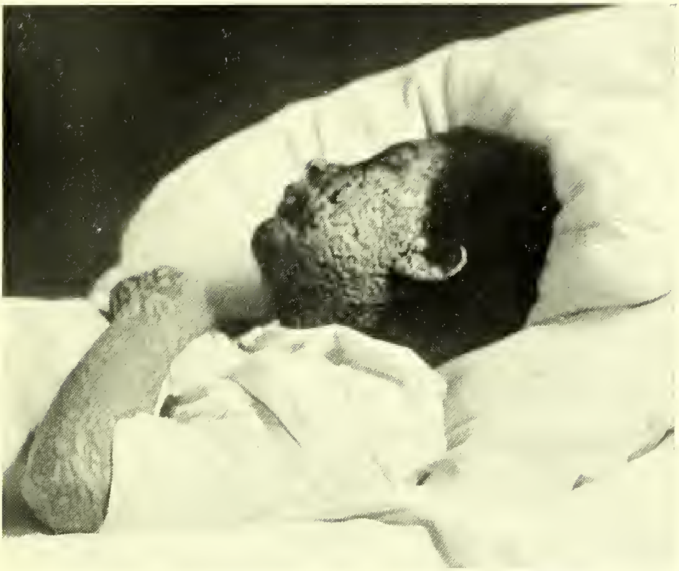
It has been suggested that this truly wonderful immunity was secured, not by vaccination, but by other means which were taken. I can only reply that as medical superintendent of the hospital and responsible for its management, I ought to know what precautionary measures were taken, and I say emphatically that *beyond vaccination no steps whatever were taken to protect the staff.* I knew that with efficient and recent vaccination no other measures were necessary, and that without it none would be of



(*Photo by the Author.*)

THE VALUE OF VACCINATION IN PROTECTING SMALLPOX NURSES.

Nurse (recently vaccinated) and child (un-vaccinated). This nurse had a sister whose husband did not believe in vaccination and objected to her being re-vaccinated. Although never knowingly exposed to infection, she unfortunately contracted the disease and died. The nurse in the photograph, although constantly exposed to infection, entirely escaped.



(*Photo by the Author*)

FATAL SMALLPOX IN A NURSE.

Nurses not protected by (recent) vaccination are as liable to take smallpox as are any other persons. This nurse was engaged at the Birmingham Poor Law Infirmary. She had never been vaccinated since infancy. Although not engaged in nursing smallpox she contracted the disease in a virulent form and died.

avail. It has been said that free ventilation of the wards and the use of disinfectants constitute a sufficient safeguard against smallpox. Only those with no practical experience of the disease could think thus. In the Leicester Hospital the use of disinfectants is practically confined to the time when the patients or nurses quit the hospital, whilst as regards ventilation, although this is undoubtedly very important for the sake of the patients and on general hygienic grounds, it would indeed be a broken reed to trust to in the case of nurses carrying out the duties detailed above.

I may mention here that two workmen temporarily employed upon some alterations at the Smallpox Hospital, but who never entered the buildings occupied by patients, contracted the disease. Neither of them had been vaccinated since infancy.

There was also the case of a housemaid at the Groby Road Hospital in 1902 (before the 1902–3 epidemic), at a time when there were a few cases of smallpox in the Smallpox Hospital a quarter of a mile away. As she had nothing to do with the Smallpox Hospital and had never entered it, it was not thought necessary to re-vaccinate her, but somehow she managed to contract the disease. Fortunately, she only had a mild attack.

We may contrast this happy experience during the last two epidemics with the experience of the staff during the 1892–3 epidemic which occurred in Dr. Priestley's time. Dr. Priestley states that the staff at the fever hospital when it was used for smallpox consisted of forty persons, all of whom, with the exception of six, had either had smallpox previously or had been re-vaccinated. These six had been vaccinated in infancy, but refused to be re-vaccinated. Five of them contracted smallpox, and one of these died. The only one of the six to escape was the matron, and she was not exposed to infection to quite the same extent as the nurses. One nurse (said to have been re-vaccinated ten years before), suffered from a doubtful and abortive attack of modified smallpox (half a dozen spots in all). She also had refused re-vaccination when Dr. Priestley offered it to her at the beginning of the outbreak, so had not been *recently* vaccinated.

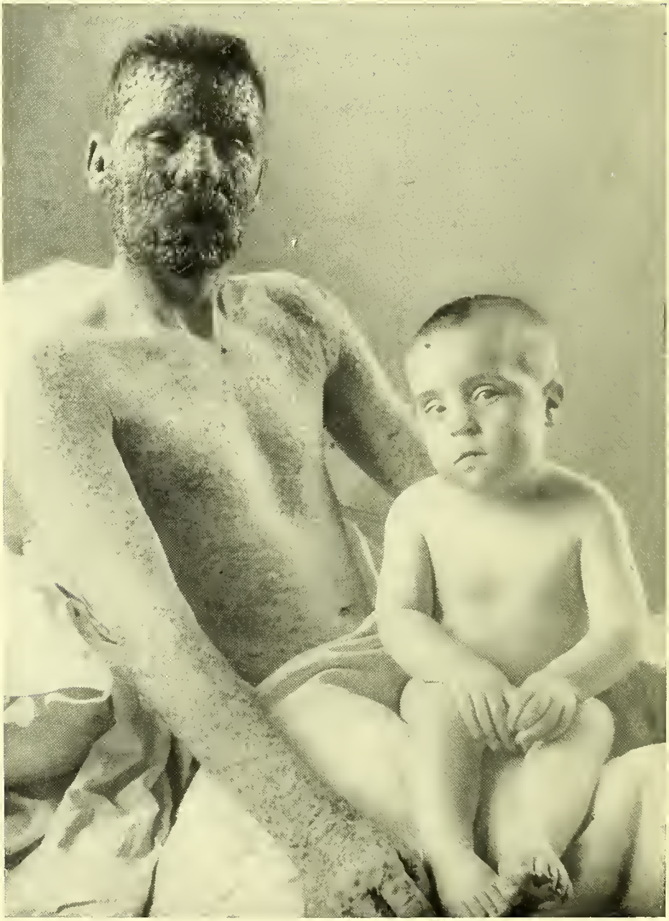
As a further contrast to the complete immunity of the Leicester smallpox nurses in the last two epidemics, when all were recently vaccinated and every one escaped, we have the unfortunate experience of the nurses at the Mile End Infirmary, when the unrecognised case of smallpox, Annie Levy, was admitted there by mistake. As already stated in Chapter VI., no less than five nurses and a wardmaid were attacked in that short outbreak as the result of being in contact with a single case, one of the attacks proving fatal. None of these nurses or the wardmaid had been recently vaccinated or even re-vaccinated.

The Effect of Vaccination after Exposure to Infection

I am satisfied, as the result of my personal experience of the vaccination of " contacts " in Leicester, that vaccination even after exposure to infection is efficacious in protecting against smallpox, provided only that the vaccination be performed within the first few days (three or four) after exposure. The explanation of this happy effect is that the incubation period of vaccinia is much shorter than that of smallpox, so that the former disease is able to " catch up " the latter, so to speak. Thus, when a case of smallpox occurs in a household—provided only that the disease be promptly recognised—it is usually possible to protect the other inmates, however severely they may have been exposed to infection. It is true, however, that there is not quite the same certainty about vaccination when performed after exposure.

This effect of vaccination, which is well-established, constitutes in my opinion a very strong argument against the necessity for infantile vaccination.

In Leicester it has been the practice, ever since the " Leicester method " was begun, to persuade as many " contacts " as possible to get vaccinated. Unfortunately, the great prejudice against vaccination existing in Leicester has made it difficult to succeed in this, and many " contacts " have refused. Personally, I have spared no efforts to convince " contacts " of the value of vaccination, and in this connection I have found the photograph which I took of my wife and children in the Smallpox Hospital of great value. I was also able from my personal experience to adduce some striking instances illustrating the value of vaccination even after exposure to infection. Several of these instances are given in Appendix VI., together with some statistics I compiled bearing on this point. Briefly, I found that out of 793 " contacts "



(*Photo by Allan Warner, M.D., D.P.H.*)

THE FOOLISH FATHER AND THE WISE CHILD !

The father, vaccinated in infancy in accordance with law, refused to be re-vaccinated after exposure to infection. The child, un-vaccinated in the eye of the law, was yet vaccinated after exposure to infection. Both father and child contracted small-pox—the father severely, the child very slightly.

The efficacy of vaccination after exposure to infection constitutes an argument against the necessity for vaccination in infancy. Vaccination performed in infancy cannot be relied upon to protect in after-life.

who got vaccinated after exposure to infection, only 17, or 2·1 per cent., were attacked; whilst out of 222 "contacts" who did not get vaccinated 29, or 13·0 per cent., were attacked.[1]

I took great pains to ensure the accuracy of these figures, and to avoid possible fallacies. I am satisfied that they are to be trusted, and that they fairly represent the measure of protection that can be obtained by vaccination after exposure to infection, where the infecting case is recognised within the first week. But if all the cases of smallpox which gave rise to the "contacts" had been recognised as promptly as they might have been—*i.e.* within the first two or three days after the appearance of the eruption—and if all the "contacts" had consented to get vaccinated at once instead of hesitating, as many did, for a day or two and thus causing further delay, I have no doubt that much better results would have been obtained.

So convinced am I of the power of vaccination to protect "contacts," provided it be performed without delay, that my chief concern when going to a house where smallpox had broken out was—not "Have the other inmates been vaccinated?" but "Are they willing to be vaccinated?" If I found that they were willing it mattered little to me whether they had been previously vaccinated or not. As a matter of fact, I found that persons who had never been vaccinated were, as a rule, more willing to undergo the operation than persons who had been once vaccinated. The latter seemed to think that, having complied with the requirements of the law as to vaccination, nothing further was necessary. There were instances where persons unvaccinated in the eye of the law, but who got vaccinated immediately when exposed to infection, escaped altogether, whilst others in the same house, vaccinated in the eye of the law, but who declined to get vaccinated again, after exposure to infection, were attacked. In Plate XI. are seen two "contacts," a father and child. The former, vaccinated in infancy, declined to be "done again." He consented, however, that his un-vaccinated child should be vaccinated. The consequence was that the father, vaccinated in the eye of the law, contracted a severe attack, as seen in the photograph; whilst the child, un-vaccinated in the eye of the law but vaccinated after exposure, contracted a very mild abortive attack, scarcely worth calling an attack. I have entitled this photograph, "The Foolish Father and the Wise Child!" and I think it illustrates well the superiority of recent vaccination—even though performed after exposure to infection—over infantile, or "legal," vaccination.

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[1] This is after making certain necessary corrections and excluding households where the first case was not recognised until after the eruption had been out for more than a week. See Appendix VI. (2), Table III.

Vaccinal Condition of Inmates of Invaded Houses prior to Exposure

We carefully recorded the condition as to vaccination of all inmates of invaded houses, and as this gives a reliable indication of the vaccinal condition of the population generally, at least in those districts of Leicester where smallpox chiefly occurred, the figures are worth quoting here. Out of 1,084 persons living in invaded houses (excluding the person first attacked) we found (in the 1903 epidemic) that 495, or 45·6 per cent., had never been vaccinated; 525, or 48·4 per cent., had been vaccinated, whilst 51 had had smallpox and 13 were uncertain (Appendix VI. (2), Table IV.).

In the 1904 epidemic we found that, out of 823 inmates, 431, or 52·3 per cent., had never been vaccinated. As the result of a house-to-house census which I caused to be made, I found that out of 4,946 persons, 1,748, or 35·3 per cent., had never been vaccinated—*i.e.* prior to the beginning of the outbreak.

The Low Case-mortality

The most striking point about the three epidemics was their unexpectedly low case-mortality. When the first epidemic occurred in 1893, the mild character of the disease was ascribed by pro-vaccinists to chance and coincidence. This explanation is hardly sufficient now, after three mild epidemics, especially when we have seen how many different importations of the disease, of various degrees of severity of type, the town has had to deal with. It seems more reasonable to ascribe the low case-mortality to the comparatively good sanitary state of the town.

The Small Part Played by the Children and Schools

Another very striking and quite unexpected feature was the comparatively small part played by the children of Leicester—

of whom something like 90 per cent. are un-vaccinated—in spreading the disease. A much larger proportion of children were attacked, undoubtedly, than would have been the case in a well-vaccinated town, but these children were chiefly infected by vaccinated adults. It would appear that under modern conditions children only spread the disease to a limited extent. The evidence of this lies in the fact that so few children were infected at school. In the two last epidemics there were ninety-four school children attacked (excluding contacts, who of course were not allowed to attend school), yet in only twenty-six instances was the infection supposed to have been contracted at school. There were only two limited school outbreaks, and neither of these was serious, and I never thought it necessary to close any of the public elementary schools in the town on account of this disease. The experience of the 1893 epidemic was similar.[1]

The explanation I have to give of this fortunate escape—so different from what was expected—is as follows: Smallpox is not infectious, speaking generally, during the incubation period. The onset is *sudden*, not insidious, so that as soon as an un-vaccinated child sickens it at once becomes *too ill to attend school.* The consequences may be very different when a vaccinated child contracts the disease. In such cases the attack is usually so slight and trifling in character that it might easily happen that it would escape detection and the child continue to attend school. In Leicester, however, the proportion of vaccinated children is so small that such a contingency has not yet happened. Should it ever occur the consequences might easily be disastrous. During the last epidemic the disease was of so favourable a type that some of the un-vaccinated cases assumed the highly modified and trivial character so often seen in vaccinated cases, and the possibility of such a case being overlooked and allowed to attend school caused me considerable anxiety. If a school outbreak had occurred from this cause, however, I have little doubt that it would have been of a very mild and benignant type, as in the case of the Ossett School Outbreak, referred to in Chapter VI.

The comparatively small part played by the un-vaccinated children of Leicester in any of the three epidemics since vaccination was abandoned is a fact of great significance, and proves,

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[1] The experience of Dewsbury, another un-vaccinated town, was also similar.

I think it will be admitted, that the danger of un-vaccinated children contracting smallpox has been over-estimated.

The Comparative Immunity of the Infants

It had been confidently expected that when smallpox visited Leicester in epidemic form the infant population would suffer, as used to be the case in pre-vaccination days. The actual facts have been that taking the past twelve years, including the last two epidemics, there has been a total of over seven hundred cases of smallpox notified; and during this period exactly twelve infants (under one year of age) have been attacked, whilst three of these have died. Moreover, some of the twelve cases, including one of the deaths, were below the vaccination age, so that these attacks cannot fairly be ascribed to neglect of vaccination.

The Influence of General Vaccination of the Population

There appears to be an impression that whenever cases of smallpox appear in Leicester the un-vaccinated persons flock to get vaccinated, and that this neutralises to a large extent the neglect of vaccination during infancy. This supposition is not correct. There is, naturally, a considerable increase in vaccination in Leicester during an epidemic, but this is largely confined to the better-class districts. In the working-class districts the number of persons vaccinated during the last two epidemics was altogether too small to have had any appreciable effect upon the course of the epidemic. I am not speaking now of the vaccination of "contacts," but of the general public.

During the two epidemic years, 1903 and 1904, the total number of primary vaccinations registered was only 3,769, although the births numbered 11,999. During the same period there were only 1,719 re-vaccinations performed by the Public Vaccinators. The number performed by private practitioners is not known, but from inquiries I made I am satisfied that it certainly was not large, and would be chiefly confined to the residential districts.

The Cost of Dealing with Smallpox in Leicester

It is sometimes alleged that the "Leicester method" is a very costly one to carry out. This is certainly not correct. Apart from the cost of treating the patients in hospital—and even well-vaccinated towns have to make provision for this—the only important item is the compensation to contacts. As was shown in the last chapter, the money cost of the 1902–3 epidemic was estimated at about £2,240, a reasonable figure compared with the cost of smallpox epidemics elsewhere. I believe that in many towns the cost of epidemics is unnecessarily large, and, which is of more importance, a great deal of unnecessary injury is done to trade by the "scare" posters that are issued urging the public to get vaccinated.

In any case it must be remembered that the "Leicester method" has been saving Leicester a substantial sum annually on vaccination.[1] If this had been carried to a reserve fund, it would have amounted, by this time, to a very substantial sum.

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[1] Every public vaccination costs the community about 5*s.* at least.

CHAPTER X

DEWSBURY AND GLOUCESTER: AN INSTRUCTIVE CHAPTER IN THE HISTORY OF SMALLPOX PREVENTION

I. THE CASE OF DEWSBURY

How not to Deal with Smallpox—Dr. Wheaton's Report on Condition of Dewsbury Hospital—Ravensthorpe: the Breakdown of Hospital Isolation—Spread of Infection from Hospital, and by Unrecognised Cases—Dr. Spencer Low's Report—The Failure of the L.G.B.

II. THE CASE OF GLOUCESTER

Dr. Coupland's Opinion—Gloucester's Tragic Experience—History of the Epidemic—Heavy Mortality amongst the Unvaccinated—Origin of Epidemic in Vaccinated Cases—School Outbreaks—Rapid Extension—Breakdown of Hospital Isolation—Comparison with Leicester—Origin of School Outbreaks—What the Government might have Done.

As a contrast to the experience of Leicester it will be well to consider that of two other towns, Dewsbury and Gloucester, where infantile vaccination was also neglected. This is the more desirable as the experience of these two places is often regarded as illustrating the impracticability of dealing with smallpox by modern measures in the presence of an un-vaccinated population. Let us see how far this contention is justified.

I. THE CASE OF DEWSBURY

The Dewsbury Union is made up of a number of sanitary districts, of which the Borough of Dewsbury is the most important. An extensive epidemic occurred in 1893, which was reported upon by Dr. Coupland for the Royal Commission, and a second one in 1904, which was reported upon by Dr. Wheaton for the Local Government Board, and for the Borough of Dewsbury by Dr. J. Spencer Low, the Medical Officer of Health. It will suffice for our purpose to confine our attention to the latter epidemic.

The Dewsbury epidemic may be said to illustrate very well how *not* to deal with smallpox. Dewsbury is a small manufacturing town, the population in 1904 numbering 27,000. There was a strong local prejudice against vaccination, and a large number of the children had never been vaccinated. There were also, of course, a great many partially protected persons, *i.e.* the class which, as we have seen, is specially likely to spread the disease. The local authority at that time can scarcely be described as very active or impressed with a full sense of its responsibilities. The hospital accommodation available for smallpox was totally inadequate for the needs of the town; it was ill-adapted for rapid extension and also improperly situated in the midst of a populous neighbourhood. With such a combination of circumstances, it was hardly to be expected that smallpox, when introduced in epidemic form, would not run riot.

Dr. Wheaton's Report on the Dewsbury Hospital

The state of things which occurred is well illustrated by a vivid picture of the Smallpox Hospital given by Dr. Wheaton in his report:

"The town smallpox hospital is situate in the borough in an unoccupied portion of the cemetery, and close to the boundary between Dewsbury borough and Ravensthorpe urban district. Its condition was very unsatisfactory. It was surrounded on three sides by an open rail fence, but there was no fence on that side facing the occupied portion of the cemetery; hence a particular patient found no difficulty in escaping at night-time from the hospital, with the result that he was discovered at his home having supper with his relatives. The hospital consisted of a collection of small galvanised iron buildings, and had a very dilapidated and forbidding appearance; nearly all the windows were broken, the apertures having been stuffed with paper or rags, and a very high fence of galvanised iron had been erected to enclose the small court in which the patients who were convalescent took the air. This fence had been provided because it was found that if the patients could be seen from the outside a crowd gathered in the neighbourhood and endeavoured to communicate with them. A fetid smell was noticeable outside the hospital, and heaps of refuse and partially consumed food lay around it, on which starlings and other birds were feeding. On entering the building the fetor was extreme ; the wards were much overcrowded and were pervaded by flies, which arose in swarms from the patients when disturbed. The interiors of the wards were very dirty, particularly the floors of the water-closets, which were of wood boarding. The hospital consisted of six small inter-communicating wards. These contained seventy-six patients, overcrowding in some of the wards being very great. Two iron temporary hospital buildings, each to contain sixteen beds, were in course of erection on the site. The laundry accommodation was unsatisfactory, there was no stove for drying clothing. A steam disinfecting apparatus had been provided.

"The smallpox cases under treatment were some of them of very severe type ; two had just terminated fatally, and it was evident that a similar termination was not far distant for several others."

As regards the effect of the hospital upon the surrounding population, Dr. Wheaton writes : "There had occurred a very severe incidence of the disease upon the dwellings within a quarter of a mile from the site."

Ravensthorpe

Ravensthorpe is another of the urban districts forming part of the Dewsbury Union, and the District Council appears to have been relying upon Dewsbury for the hospital isolation of smallpox. As soon, however, as Dewsbury Corporation hospital became full, which it very quickly did, Ravensthorpe was necessarily left to shift for itself. Dr. Wheaton writes : "Since August 13th . . . the Dewsbury Corporation had declined to admit more cases from outside districts, and consequently, there were, I found, sixteen persons suffering from smallpox being retained in their own homes at Ravensthorpe, and the disease appeared to be extending. The Ravensthorpe smallpox was attributed to Dewsbury, with which the district is continuous and more particularly to the influence of the Dewsbury Smallpox Hospital, which was situated close to the boundary of Ravensthorpe. . . .

"On October 13th I again visited Ravensthorpe Urban District and found the conditions there greatly altered for the worse. Owing to the inability of the Dewsbury Corporation to admit smallpox cases from Ravensthorpe to their hospital, Ravensthorpe patients had, since September 22nd, all been retained in their homes, consequently the disease had greatly increased in the place. In the three weeks following my first visit the notified cases had been 27, 28, and 12; and in the week ending October 15th there were 25 cases. *On this, my second visit, there were no less than 52 cases of smallpox retained in their own dwellings,* and the Medical Officer of Health, Mr. Richardson, had been engaged by the Urban District Council to attend these persons at their own homes. The Council had also engaged several additional men to carry food to the sufferers, also to sit up with and to control those patients who were delirious in order to prevent them escaping into the streets. In spite of my advice on a former occasion the Council had not insisted upon the vaccination and re-vaccination of persons employed by them in connection with smallpox, and, as a result, three of them had already contracted the disease. *In spite of this experience I found that men were still being employed on duties in connection with smallpox who had not been protected by re-vaccination.* The Council were at this time spending no less a sum than £50 per week in supplying food and other requisites to 'contacts' retained in their homes. I visited a number of the infected houses and found that the condition of some of the families in which the disease had occurred was altogether pitiable. Nurses had not been provided, and in many instances persons who were only just recovering from smallpox, and were quite unfit to be out of their beds, were attending on relatives who were in the acute stage of the disease. In this respect the women suffered most, since they had, in addition to attending the sufferers, to perform their ordinary household duties. As a rule the homes of Ravensthorpe are well furnished and the people are well off in a material sense; but few dwellings have more than two bedrooms, and hence the conditions arising where several cases of smallpox had occurred in the same household were often such as would hardly be credited as possible of existence in a civilised country. In many instances healthy people had to sleep with persons suffering from smallpox; and children were being recklessly exposed to the infection, their parents in many instances refusing to allow them to receive the protection afforded by vaccination. In one small bedroom in a particular dwelling I found three adults suffering from smallpox ; one single woman aged twenty-five in one bed, and two single men in another ; another healthy woman slept at night in the same bed with the female above referred to as suffering from smallpox. Parents still refused to have their children vaccinated, even though exposed to smallpox infection, or to themselves acquire the protection afforded by vaccination or re-vaccination ; in one family six smallpox cases had occurred, in another seven. The Ravensthorpe people appeared indeed to be quite apathetic as respects smallpox, and to have become accustomed to its presence, regarding it as a calamity, which it was hopeless to fight against. In one dwelling which I visited the father had himself suffered from smallpox ; in one room upstairs was his son, un-vaccinated, in the acute stage of the disease; in another room his wife, vaccinated in infancy by two insertions, also in the acute stage. These people were attended by the daughter, un-vaccinated, aged fourteen years, who was just recovering from the disease ; downstairs were the youngest child, who had been vaccinated, after legal proceedings by the Vaccination Officer, and who appeared quite healthy, and an elder child which remained un-vaccinated. I urged the father to have this remaining un-vaccinated child vaccinated; but he declined. I asked him if he was not convinced of the protection afforded by vaccination, since he knew that the medical men who were constantly going in and out of the infected houses had none of them taken the disease ; but he replied that the medical men were protected by a charm with which they would not part. The remaining un-vaccinated child in question, I was informed, subsequently developed the disease, but the child vaccinated under pressure of the Vaccination Officer remained healthy" (italics added).

All this, be it observed, occurred as recently as 1904—only ten years ago.

A somewhat similar state of affairs appears to have existed in the Liversedge urban district, also forming a part of the Dewsbury Union. Dr. Wheaton writes: "At the time of my visit on October 4th, thirty-four smallpox cases had occurred since July 8th; of these, four only had been removed to hospital. In spite of previous warnings from repeated outbreaks of smallpox, the Mirfield and Liversedge Joint Hospital Board . . . did not provide a smallpox hospital until October."

A similar story is told of other districts of the Dewsbury Union.

Dr. Spencer Low's Report

Turning now to Dr. Spencer Low's report, we find emphasis laid upon the part played by un-recognised cases of smallpox in spreading the disease. Thus, we are told of a man who was summoned and convicted for failing to notify a case of smallpox. This man had himself had a mild attack of the disease ; a fortnight later one of his sons was attacked, and some three weeks later, his wife, another son, and the man next door, together with his son, were attacked (this latter boy dying from the disease).

It was not until the occurrence of this last group of cases that the existence of the disease was discovered ; had the first case been a well-marked one, such as would occur in an un-vaccinated man, it is in the highest degree improbable that the man could have concealed the existence of the disease. But when a man only has a few spots, with trifling constitutional symptoms which soon pass away, there is a strong temptation for him not to consult a doctor, and to say nothing about his illness. Dr. Low gives a long list of these unnotified cases which afterwards came to the knowledge of the Health Department, together with a number of persons who were known to have been infected by them ; the list comprises, Dr. Low believes, only a fraction of those which occurred or which were actually infected in this way.

Under the head of "Infection Received at School," Dr. Low remarks that "this does not appear to have been a factor of any great magnitude," and only once was a school closed on this account. This is the more remarkable when we consider how many of the school children in Dewsbury must have been un-vaccinated (the number was estimated by Dr. Low as being 66 per cent. at the beginning of the outbreak), and that the disease had got almost entirely out of hand ; yet it only agrees with a similar immunity experienced by the un-vaccinated school children in Leicester.

Under the head of "Infection Received from Unascertained Sources," Dr. Low gives an example to show how cases may arise in this way: A woman, M. W., left Dewsbury for

Southport on a certain Saturday. During the next week she developed a rash and consulted a medical man in Southport. Then we have the old story of how the medical man failed to recognise the nature of the disease, but told her to go home and stay in bed until the rash subsided. She accordingly returned to Dewsbury, with the rash out on her, and two days later she was removed to the Dewsbury smallpox hospital. It is not known how many persons she infected between Southport and Dewsbury. No doubt all would be ascribed to unascertained sources.

Under the heading of "Origin and Progress of the Epidemic," Dr. Low refers to the fact that a man with an eruption of smallpox upon him was present at a fête in the public park, with the result that a considerable number of cases were notified about a fortnight later among persons who had also attended the fête.

We are not told whether this man had been vaccinated or not, but had he been un-vaccinated it is extremely unlikely that he could have attended the fête. Moreover, had he been unvaccinated, it is probable that the fact would have been duly recorded.

Dr. Low observes: "This unfortunate occurrence no doubt served to keep up the infection of smallpox, which might otherwise have died out."

The Failure of the Local Government Board

No one realises more than the writer the splendid services rendered to the cause of public health by the Local Government Board and its able Medical Department, but in the matter of smallpox prevention in the past I feel bound to say that very much more might have been done.

It would have been infinitely better for Dewsbury if Dr. Wheaton—the medical inspector whom the Local Government Board specially sent down—instead of merely criticising and making suggestions when he found the serious difficulties in which the town and neighbouring districts were placed owing to the total inadequacy of the available hospital accommodation, had been able to wire at once to headquarters for a portable smallpox hospital of, say, one hundred beds, complete with all the necessary equipment and staff. That would have been help indeed, which would probably have altered the whole course of the epidemic. Nor would there have been any difficulty in doing this if only the necessary arrangements had been in existence beforehand.

I shall refer to this suggestion again in the next chapter.

Fortunately, the old idea that infantile vaccination is the first and principal line of defence is rapidly disappearing, and I feel confident that attention and effort will be more and more concentrated upon those modern measures which have come to take its place.

II. THE CASE OF GLOUCESTER

"It is not unlikely that had Gloucester been better equipped for the emergency, had its sanitary organisation been more on a level with what should be the rule in cities of its importance, the epidemic might not have attained such proportions" (Dr. Coupland's Report to the R.C.V.).

The unhappy experience of Gloucester is so often quoted by pro-vaccinists as a "set-off" against that of Leicester, that although I am not attempting to deal with smallpox epidemics prior to the time of the Royal Commission, I will make an exception in the case of the disastrous epidemic which occurred in Gloucester in 1895-6.

This epidemic is generally regarded by the orthodox as a shining example of the folly of neglecting infantile vaccination. Indeed, pro-vaccinists are just as prone to quote Gloucester as anti-vaccinists are to quote Leicester.

Both towns were strongholds of the anti-vaccination movement, and in both infant vaccination had been much neglected. But whereas Leicester escaped very lightly, Gloucester's experience can only be described as a great disaster. Indeed, no other epidemic of recent times can be at all compared with it.

In a town of only 40,000 inhabitants there were 1,979 cases of smallpox, most of these occurring within the short space of five months. Moreover, the type of the disease was unusually severe, and no less than 434 of the cases proved fatal, equivalent to a case-mortality of 21·0 per cent. Whilst the epidemic was at its height, Gloucester was in the position of a plague-stricken city, shunned by the rest of the world; hotels were deserted, and trade was very seriously affected.

Although a majority of the cases occurred amongst persons who had once been vaccinated, the mortality was chiefly amongst the un-vaccinated section of the population, more so, indeed, than is usually the case. This was accounted for by the fact that the disease got amongst the children of the town, who chiefly constituted the un-vaccinated class in Gloucester, as in other badly vaccinated towns.

The Gloucester epidemic undoubtedly shows that an extensive and fatal epidemic of smallpox may occur (given the necessary conditions) in a town where infantile vaccination has been neglected, and that the un-vaccinated cases will furnish an undue proportion of the deaths. The value of vaccination is thereby supposed to be fully demonstrated, and that is as far as the average pro-vaccinist thinks it necessary to go.

History of the Epidemic

If the history of the epidemic be carefully studied, however, there are many other important lessons to be learnt from it, and the neglect of infantile vaccination will, I think, be found to lose much of its significance.[1]

The most remarkable features of the outbreak were the enormous rapidity with which it extended, once the authorities lost control of it, and also the large number of children attacked. Dr. Coupland states: "The account given in this report of the rise and progress of this exceptional epidemic shows that for the first six months of its course it created but little anxiety. The cases which arose were traceably connected with one another;

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[1] The late Dr. F. T. Bond of Gloucester, Founder and Hon. Sec. of the Jenner Society, and for many years the great champion on the pro-vaccinist side, became in his later years so shaken in his belief in the necessity for compulsory infantile vaccination that he publicly recommended that the age-limit for vaccination should be raised to *six years*, at the same time asking that re-vaccination should be made compulsory. Such a proposal, of course, involves throwing over compulsory infantile vaccination entirely! Mrs. Garrett Anderson, the Hon. Sec. of the Imperial Vaccination League, joined Dr. Bond in advocating this sweeping reform. It is to be noted that this was after, not before, the Gloucester epidemic, with all the details of which Dr. Bond, although not the Medical Officer of Health for Gloucester, was quite familiar.

they were promptly removed to hospital on receipt of notification, and the system, now generally adopted, of 'quarantining' the infected households was carried out with efficiency; but the sanitary staff and the hospital accommodation which sufficed for an outbreak of such limited dimensions could not be expected to cope with that which soon developed. . . . In the middle of February there was a striking exacerbation. . . . This increase was due to the fact that within a few days of one another about forty children attending the Widden Street Infants' School were attacked."

Shortly afterwards, another school, St. Luke's, became affected, and twenty-six cases occurred amongst the scholars in the Infants' Department there within a few days. It was at this point that the resources of the Health Department of the Municipality became exhausted, hospital isolation hopelessly broke down, and the authorities entirely lost control of the epidemic. Consequently, most of these cases in school children had to be left to be nursed at home, and they started fresh centres of infection in as many different houses in almost as many streets. From that time onwards, for about three months, the situation can only be described as a débâcle; the conflagration raged continuously; and finally went out almost as suddenly as it began!

As regards the origin of the outbreak and the causes which led to such rapid extension, which, after all, are by far the most important considerations from the point of view of smallpox prevention, Dr. Coupland tells us that the first case occurred in an official on the railway, vaccinated in infancy, who was probably infected at Burton-on-Trent. "Fortunately he was promptly isolated, and no further cases occurred in connection with his attack." "*But, as so often happens, the earliest cases in an epidemic are to be found amongst those whose nature has been unrecognised*, or which have been unattended medically and not notified to the authorities." And then we have the familiar story of mild cases in vaccinated persons, undetected and going about spreading the disease. Dr. Coupland gives particulars of some of these unrecognised cases which occurred at the beginning of the outbreak, and proceeds: "*It is notorious that the spread of smallpox is often to be traced to individuals suffering from such mild attacks that they are able to go about.*" It is certainly a point worthy of note that, in spite of the large proportion of un-vaccinated persons in Gloucester—who according to the orthodox theory are such a danger to the community—the first four or five cases which occurred, and no less than twenty-three cases out of the first thirty-three, *were all in vaccinated persons.* Later on, when the epidemic got out of hand, the un-vaccinated, as is always the case, fell victims to the infection like stubble before the flame. There does not appear to be any evidence whatever, however, that it was the un-vaccinated condition of Gloucester which was in any way responsible for the beginning of the epidemic.

Dr. Coupland proceeds to refer to the breakdown in the sanitary organisation: "It was most unfortunate that the decision to improve the administration of the hospital was not taken earlier." Owing to gross overcrowding, maladministration (which under the circumstances was not at all to be wondered at), and high fatality amongst the patients treated there, the hospital fell into grave disrepute, and even after sufficient accommodation had been provided, people refused to make use of it. In the event, the great majority of the cases were left to be treated at home, viz. 1,267 out of 1,979, or 64 per cent. In the simple statement above, we have the key to the whole situation. Again to quote Dr. Coupland: "Thus, then, it is clear that the leading principle of dealing with an infectious disease, namely, the effective isolation of the attacked, was for the chief part of the outbreak in abeyance, and as also the quarantining of invaded households could no longer be controlled, but only advised, the facilities for the spread of the disease became unlimited."

Dr. Coupland adds that whilst there was little wonder that the epidemic attained such great proportions, it was certainly remarkable that it ceased so abruptly. It was difficult, he says, to estimate the part played by the adoption of universal re-vaccination. Personally, I should say that, in view of the large amount of vaccination performed by the six special vaccinators appointed to make house-to-house visits for the purpose, vaccination probably contributed to the result, but it is almost certain, in view of the extraordinarily abrupt cessation, that there were other and more subtle "epidemic" influences at work. We have seen that in Leicester, in 1903, where general vaccination was not resorted to, a similar and almost equally striking cessation occurred.

Comparison with Leicester

In comparing Gloucester with Leicester, Dr. Coupland says (p. 9): " In one particular, without a doubt, Leicester does enjoy an advantage over either Dewsbury or Gloucester, and that is in respect to its sanitary government. . . ."

And on p. 10: " In certain respects, undoubtedly, the larger town (Leicester) was superior, as indeed might be expected, not only from its size, but from the great attention which it has for many years paid to sanitation." Dr. Coupland explains that he is not referring so much to such questions as drainage or water supply, but to sanitary administration: " It is, however, to my mind a very important matter, especially in times of epidemic, that the Medical Officer of Health should, as in Leicester, be in such a position as to be enabled to devote all his time to the sanitary service. It is at such times, especially, that the value of having an independent officer for this purpose can be best appreciated. It is neither fair nor just to expect that one whose time and attention are necessarily diverted by the calls of private practice can be able to do as much public work as will one not so engaged. With a Medical Officer of Health in responsible authority, and occupied solely with his official duties, it is not likely that the hospital would have become so overcrowded, and its management so chaotic . . . . At Leicester, where the medical officer is independent of private practice, it is possible for him to keep himself in personal touch with all smallpox cases, to trace out their individual history, and to have medical charge of them in the hospital, which is wholly under his direction. . . . ." " During the smallpox outbreak it was possible for every infected house to be visited by an inspector every day for the fortnight of ' quarantine,' a duty which was also performed in Gloucester until, with the great multiplication of these infected centres, it became quite impossible to carry it on."

Origin of School Outbreaks

It remains to consider the origin of the serious school outbreaks already referred to and which Dr. Coupland considers were the chief cause of the epidemic getting out of hand. I have already mentioned that at these two schools, Widden Street and St.

Luke's, some forty children in the one case, and twenty-six in the other, sickened within the space of a few days. Altogether forty-five cases in the one school, and thirty-two cases in the other occurred in a "single crop," *i.e.* they did not infect one another but were all (in each school) infected presumably from a common source. Dr. Coupland states that the cause of these outbreaks was not discovered, but with the increased knowledge which we now possess as to the all-important part played by unrecognised cases, there can be little doubt that some slight overlooked case of smallpox was attending school probably for at least a week whilst still infectious. Owing to the overworked condition of the staff it was no doubt out of the question to make a thorough search for such a case. The staff had too much to do already in attempting to look after the notified cases without going out of their way to search for cases. Whether such an overlooked case occurred amongst the other scholars or amongst the teachers I cannot of course say, but in view of the severe type of disease prevailing, I have not the slightest hesitation in saying that it was almost certainly in some person who had been vaccinated. In an un-vaccinated person the attack (in view of the type of disease prevailing) would have been altogether too severe to escape detection or for the sufferer to have continued to attend school. If this surmise be correct—and I think that those who have followed me thus far will at least admit the probability of its being so—then it places the etiology of the Gloucester epidemic in a very different light from that in which it is usually regarded.

A further cause for the spread of infection was the improper position of the smallpox hospital, and the lack of control in its administration. The condition of things at the hospital was very similar to what has already been described as existing at the Dewsbury Hospital, only, owing to the greater number and greater severity of the cases, it was more serious, and productive, no doubt, of more mischief.

Of course, I freely admit that the epidemic having once got out of hand, the large number of un-vaccinated children added fuel to the flames, and not only increased the numbers of those who contracted the disease, but greatly increased the number of those who succumbed, or were permanently injured or disfigured.

The prejudice against vaccination which existed in Gloucester was most unfortunate, as it would be in Leicester should such a catastrophe as the Gloucester epidemic overtake the latter town, but it must always be remembered in this connection that it is the compulsory law which is responsible *almost entirely* for this prejudice, and for the organised opposition to vaccination which does so much to encourage this prejudice. I believe that within a few years of the repeal of the Vaccination Acts organised opposition to and prejudice against vaccination will have largely disappeared.

But for the great local prejudice against vaccination in Gloucester, it would have been a comparatively easy matter to have cut short the epidemic in three weeks by a universal vaccination of the whole town.

But, having admitted that the un-vaccinated persons in Gloucester were the chief victims in the epidemic, I assert most emphatically that I can find little in the history of the outbreak which lends support to the suggestion that it was the neglect of infantile vaccination which was in any way responsible for the outbreak.

What the Government Might have Done

There is the same important lesson to be learnt from the Gloucester epidemic as there was in the case of Dewsbury. Even if Gloucester had been very much better provided in the matter of hospital accommodation than she was, it is probable, owing to the rapid extension of the epidemic which took place when the schools became infected, that her existing accommodation would have proved inadequate. Also, even if the town had extended its accommodation much more rapidly than it did, there would have been the difficulty in obtaining on the spur of the moment suitable expert staff. Moreover, it is, after all, rather unreasonable, besides being a quite unnecessary expense, to expect every little town in the country to provide and keep ready smallpox hospital accommodation sufficient for any emergency on account of a contingency which very probably will never arise. I wish again seriously to suggest that, seeing that a smallpox epidemic in any part of the country is a grave menace to the rest of the country, it is clearly the duty of the Government to be prepared to come to the immediate assistance of any locality which may have the misfortune to be attacked by smallpox in epidemic form. It would be a perfectly simple thing for the Local Government Board to keep several portable hospitals in readiness for such emergencies, whilst, as regards staff, they could enter into agreements with various big hospital authorities to supply trained nurses at a moment's notice, an adequate retaining fee being paid for this service. And what I am suggesting now as regards hospitals and nurses applies also to sanitary staff, including medical officers and inspectors specially trained in the modern methods of smallpox prevention. The practice of the War Office affords a good precedent. If human enemies invaded these shores and succeeded in establishing themselves, the Government would never dream of leaving it to the local Territorials to deal with them, more especially if it were found that these were not strong enough for the task. If a battle occurred and there were many wounded to be cared for, hospitals would be despatched immediately. There is no more difficulty in providing portable smallpox hospitals than portable military hospitals. As for the difficulty in finding a suitable site at a really safe distance from populous neighbourhoods, local authorities should be given ample compulsory powers, if the present powers are insufficient, and in any emergency the Local Government Board should have power to declare "martial law," so to speak, and to commandeer a suitable site and take any other necessary steps without formality. Distance from the town would be no drawback if up-to-date motor ambulances were available. With such arrangements it is almost certain that any epidemic could easily be kept in hand, and as soon as the outbreak was over the equipment would be withdrawn to be held in readiness for an invasion in some other part of the country.

As regards the cost of carrying out this suggestion, it would be a mere trifle for the Government, especially when compared with the large sums which are at present devoted to encouraging vaccination. It is unlikely that the assistance of the Government would often be required in actual practice, so that, once the necessary arrangements had been made, and the necessary equipment obtained, the annual cost would be very little. I would respectfully suggest that one of the medical inspectors hitherto told off for vaccination work should be made responsible for the organisation and supervision of this new branch of work.

CHAPTER XI

INJURIES CAUSED BY VACCINATION

Difficulty of Appreciating Vaccinal Injuries at True Value—Anti-vaccinists Exaggerate, Pro-vaccinists Under-estimate them—Pecuniary Interest of Medical Profession—The Misterton Outbreak of Vaccinal Erysipelas—Other Outbreaks—The R.C.V. and Injuries Caused by Vaccination—The Minority Report—Dr. T. D. Acland on Vaccinal Injuries: Eczema; Impetigo; Erysipelas; Ulceration and Abscess; Gangrene; Septic Infection; Vaccinal Syphilis—Concluding Remarks.

In discussing the question of vaccinal injuries, it is difficult to avoid the possibility, on the one hand of exaggerating, and on the other of under-estimating their importance. I am satisfied that anti-vaccinists fall into the one extreme, but I also believe that medical men, as a class, tend to fall into the other. I think that they attach too little importance to the undoubted injuries which have been in the past, and to a lessened extent are still being, caused by vaccination.

It is not difficult to understand how this attitude of medical men towards vaccination has arisen. They have always believed in the immense value of vaccination as an indispensable protection against a loathsome disease. It is not much more than a generation ago since smallpox was a very real danger in this country, and the injuries caused by vaccination must have appeared at that time to be trifling compared with the far greater injuries caused by smallpox. It was in perfect good faith that medical men tried to encourage vaccination, and it is easy to understand that a tendency grew up to minimise rather than to emphasise any risks attending the operation. This tendency would naturally increase when an organised opposition arose, and when every case of apparent injury caused by vaccination or of any complication following vaccination, was seized upon and made the most of, and was perhaps ascribed to negligence on the part of the practitioner who performed the operation. Undoubtedly, many cases of alleged injury have been most unfairly attributed to vaccination by anti-vaccinists. Consequently, it is hardly to be expected that instances where unpleasant symptoms have followed vaccination should be recorded and published by medical men with the same freedom as would otherwise be the case.

When genuine cases have occurred, therefore, assuming that they did not prove fatal, they have been largely confined to the knowledge of the individual medical men concerned, and being relatively few in number the impression made by them is likely to have been effaced by the long series of cases where vaccination has run a normal course and caused no trouble.

Moreover, there has been a tendency, I think, to ascribe injuries following vaccination to some extraneous cause rather than to vaccination itself. Either the mother was careless and allowed the vaccination lesions to become contaminated, and so set up erysipelas or other form of septic inflammation ; or some pre-existing condition which would have appeared in any case was brought out by the vaccination ; or the untoward symptoms were quite independent of the vaccination, and the association of the two was to be ascribed to coincidence. In some such manner it has been easy to explain away a large proportion of the cases which, *prima facie,* have appeared to be due to vaccination. I wish to repeat that I believe medical men as a class have acted in good faith in this matter, but none the less I think that they do tend to minimise and under-estimate the importance of the injuries caused by vaccination.

Holding this view as I do, I cannot be very severe on the anti-vaccinists for falling into the opposite extreme (as they palpably do) and exaggerating the injuries caused by vaccination. I have given some examples of the hyperbole indulged in by the anti-vaccinists in Chapter I.

I feel, also, that anti-vaccinists—mistaken though they be—at least have some excuse for their extreme views. Most of them are entirely sceptical—and we must admit their scepticism is sincere—as to vaccination having any real protective influence against smallpox, and they regard the operation as wholly useless.

Pecuniary Interest of the Medical Profession

Then, too, there is the fact that medical men have a pecuniary interest in vaccination. Anti-vaccinists make far too much of this consideration, and impute the most sordid motives. They openly insinuate that if there were no money to be made out of vaccination, medical men would soon cease their advocacy of it. The injustice of this accusation is demonstrated by the fact that Medical Officers of Health, who as a class do not make a penny out of the practice, are amongst the warmest advocates of vaccination. But at the same time the pecuniary consideration cannot be ignored. It is there, and it always has been there, and it must have tended, indirectly and unconsciously no doubt, but in the aggregate not inappreciably, to colour the attitude of the profession in favour of vaccination. I cannot think that it would have made no difference whatever to the esteem in which vaccination is held by medical men, if there had never been a financial consideration. I believe that this consideration has also had its effect on medical opinion in regard to the particular aspect of the question we are now dealing with, viz. the injuries caused by vaccination.

The Misterton Outbreak of Erysipelas following Vaccination

As some justification for the extreme attitude of the anti-vaccinists, reference may be made to an outbreak of erysipelas following vaccination which occurred in the Misterton District of the Gainsborough Union in 1876, and which was reported upon to the Local Government Board by Mr. J. Netten Radcliffe.[1]

These cases occurred thirty-eight years ago, and I do not suggest that such a series of vaccination disasters is at all likely to occur at the present day, but such cases could and did occur at the time the movement against vaccination was coming into existence. The Leicester Anti-Vaccination League had been formed some eight years prior to the date of the events I am about to relate, and without doubt the impression made by the Misterton cases and others like them still remains.

Very briefly the facts were as follows: On September 26th, 1876, Dr. T. B. W., Public Vaccinator, vaccinated a child, Walter

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[1] Published in Appendix IV., Fourth Report, R.C.V.

Burdon, aged five months. The vaccination appears to have taken satisfactorily, and on the eighth day Dr. W. inspected the arm and took lymph from it charging some 15 or 16 " points." Old "points" were used for this purpose, but they are stated to have been washed before using and wiped on a towel. With this lymph from the child Burdon, Dr. W. vaccinated some sixteen other children. The results were as follows:

(1) Henderson, Joseph, aged five months. Vaccinated on October 3rd in four places, three successful. On eleventh day redness and swelling of the vaccinated arm set in; this spread down to the tips of the fingers and up to the shoulder and back. The child became acutely ill, the skin in the affected region became dark and livid, and death occurred on twenty-second day after vaccination.

The cause of death was certified by Dr. W. as " Erysipelas, six days." No mention was made as to the child having been recently vaccinated.

(2) Baker, Edwin George, aged three months. Vaccinated on October 3rd; on evening of eighth day child became restless and feverish; the next morning the vaccinated arm was noticed to be swollen and " nearly purple " from the elbow to the shoulder. The inflammation extended, and on the fifteenth day child had a convulsive seizure. It was next discovered that the thighs had become hard and dark in colour, and that the trunk was similarly affected. The general disturbance of the system now became profound. Vesications formed on the red and swollen hand, the colour of the affected skin deepened, everywhere becoming livid, and the child died on October 19th. The cause of death was certified by Dr. W. as "Retention of urine, diffuse inflammation of kidneys, bladder and scrotum." Again there was no mention of vaccination or erysipelas.

(3) Cotton, Mary, two and a half months. Vaccinated October 6th. The day after vaccination the arm began to redden at the place of inoculation, and the redness increased day by day until it had involved " the whole of the skin of the vaccinated arm, of the neck and scalp, of the trunk, of the right arm as low down as the knuckles, and of the legs to below the knees. The redness spread ' like a fire ' and wherever the redness went, there was much swelling." Vesications formed in many places, and these rupturing gave off a sanious discharge and occasionally bled. The child died on October 31st, the family having meanwhile moved into another district. Up to two days before death the child is said to have had no medical attendance. A Dr. C. was then called in, and he certified the death as due to " Pyæmia." There was still no mention of vaccination or erysipelas.

(4) and (5) These cases were also attacked by erysipelas, but fortunately recovered.

(6) In this case the vaccination did not " take " and the child suffered no ill-effects.

(7) Parker, Charles, four months. Vaccinated on October 9th. It is unnecessary to repeat the harrowing details. In the case of this child also erysipelas supervened and death occurred on the eighteenth day. Dr.

W. certified the cause of death as "Pneumonia, three days." No mention was made of vaccination or erysipelas.

This child infected a brother, aged three, but fortunately the attack was localised, and after suppuration of the thumb the lad recovered.

(8) This case was attacked by erysipelas on the eighth day after vaccination. An abscess formed in the arm-pit, but fortunately the case was not fatal.

(9) Woodhouse, John George, seven months. Vaccinated October 9th. Erysipelas supervened on seventeenth day, and the case proved fatal on thirty-second day. The cause of death was certified by Dr. W. as "Inflammation of thorax and arm, ten days." No mention made of either vaccination or erysipelas.

No. 10 had a slight attack of erysipelas, and No. 11 had an attack of eczema.

(12) Scott, Alice Laura, eight months. Vaccinated October 9th. Erysipelas on fifth day, died on twenty-sixth day. Cause of death certified by Dr. W. as "Scarlatina, erysipelas, three weeks."

No. 13 escaped; Nos. 14, 15, and 16 had slight attacks and recovered.

Altogether, out of sixteen children vaccinated in this series, eleven developed erysipelas, of whom six died.

Five other cases of erysipelas following vaccination occurred in the same district about the same period, two of which proved fatal.

Referring to Dr. W.'s method of vaccinating, Mr. Netten Radcliffe described him as being "reprehensibly careless." His lancets were blunt and rusty, both blades and handles were dirty, whilst his "points" were described as "filthy." Moreover, the used "points," smeared with blood, were carried mixed up with the unused "points."

Mr. Radcliffe was unable to trace the source of the infection, but very properly blamed the dirty methods of the vaccinator. He also drew attention to the insanitary surroundings of many of the homes.

No one will deny that the above account constitutes very painful reading.

It is true that it was very exceptional and that the events took place so long ago as 1876, before the vogue of antiseptics, and when public vaccinators were less careful than I believe they are to-day. The mere fact that arm-to-arm vaccination has been superseded by glycerinated calf-lymph vaccination obviates some of the danger. It is probable that if such dirty slovenly methods were proved to-day against a public vaccinator, he would be prosecuted for criminal negligence. But the fact remains that such things have occurred in the past, and that parents were compelled by law to submit their helpless children to the risk of them.

Other Outbreaks

Other similar outbreaks of erysipelas following vaccination were investigated by the Local Government Board about the same period. Thus in the same year, 1876, there were six deaths at Gainsborough, although in none of these was vaccination mentioned on the death certificate.

In 1878 there were six cases with three deaths at Plomesgate. In 1879 there were ten cases of erysipelas or abscess with four deaths at Clerkenwell, and in these it was clear that the infection of erysipelas was conveyed at the time of vaccination (Minority Report, Sect. 192).

In 1882 a Memorandum was issued by the Local Government Board relating to a series of seven cases of erysipelas following vaccination which had occurred at Norwich. In this instance four of the seven cases proved fatal, but in only one case was vaccination mentioned on the certificate of death; in this one case the certificate was not given by the medical man who performed the vaccination.

The Public Vaccinator in this series also was blamed for his dirty methods.

In the same year the Local Government Board inquired into a death following vaccination at Derby. Here again the Public Vaccinator was blamed for his methods and severely censured for "the erroneous entries in his register, and for his manifold disobedience to the Board's instructions."

In 1883 there were three cases of extensive erysipelas at Blandford; and in the same year there were three fatal cases at Sudbury.

Between November 1st, 1888, and November 30th, 1891, 132 cases of inflammatory or septic disease (mostly erysipelas) following vaccination and terminating fatally were the subject of inquiry by the Local Government Board.

In 1890 a series of injuries from vaccination occurring in Norfolk were investigated for the Royal Commission on Vaccination by Dr. Barlow. Some sixteen children suffered from inflamed arms, some exhibiting secondary abscesses in the axillary glands with subsequent wasting and grave disturbance of health.

Two had large abscesses in the leg. Three of the cases terminated fatally; in one of these death was certified as due to "convulsions," in another to "pyæmia," and in the third to "asthenia, tabes mesenterica."

These "accidents of vaccination" happened many years ago, but accidents, though less frequent, still happen at the present time. Thus, at an inquest held on October 23rd, 1913, on the body of John Brown, aged 18, second-class stoker on H.M.S. *Pembroke*, it was stated that he joined the Royal Navy on September 11th, was vaccinated on September 25th, was put on the sick-list on October 1st, and was admitted to hospital on October 8th, suffering from an abscess on the left arm at the seat of vaccination. He died on October 20th from "septicæmia following vaccination."[1]

A somewhat similar case is that of Henry Plant, aged 18, second-class stoker in the Royal Navy. He was admitted to the Navy on September 1st, 1911. He was drafted to H.M.S. *Renown* on September 24th, and shortly afterwards was vaccinated on the left shoulder. On October 19th he was admitted to Haslar Hospital suffering from "influenza." Whilst in hospital he had "severe shooting pains" in his left shoulder. On November 4th an abscess was found to be present, and an operation was performed. A second operation was performed on December 5th, 1911. On February 8th, 1912, he was "invalided from the Navy," suffering from "diseased bone and peritonitis," and sent home. He was subsequently admitted to Wolverhampton General Hospital, where he was detained for ten months. On July 9th, 1912, the left arm was amputated through the shoulder. The septic process appears to have spread, and an operation had to be performed on the right arm on November 11th, and on the right arm and left leg on December 18th, 1912. It is stated that the Admiralty allege that the disease from which this man suffered was constitutional, and had no connection with vaccination, and have therefore declined to make him any grant or compensation, and his service was of course too short to entitle him to a pension. Yet the man states that he was "in splendid bodily and physical condition up to the time of being vaccinated, and had never suffered from constitutional or venereal disease." He was of course medically examined and passed as "fit" before being admitted to the Navy.

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[1] *The Jennerian*, March 22nd, 1913, p. 20. On the same page appears the following: "To sum up then, vaccination is an undoubted blessing to mankind. It is harmless if carefully practised on healthy subjects."

The above account is taken from a signed statement made by the man, and dated February, 1914. I have not seen the Admiralty's reply, if any has been made.

Undoubtedly, if re-vaccination of adults were universal, instead of being confined to a comparatively small section of the population as at present, such cases as these would be more numerous.[1]

The Royal Commission and Injuries Caused by Vaccination

No. 3 of the terms of reference to the Royal Commission on Vaccination instructed the Commissioners to inquire and report as to "the nature and extent of any injurious effects resulting from vaccination." They received and recorded a very great mass of evidence bearing on this aspect of the question, and their finding was as follows: they said that "although some of the dangers . . . are undoubtedly real and not inconsiderable in gross amount," yet they were insignificant when considered in relation to the amount of vaccination work done. They thought that they were diminishing, and with further precautions would further decrease. They admitted that "it was not open to doubt that there had been cases in which injury and death had resulted from vaccination." They said: "It is freely to be admitted that vaccinia, like varicella, does occasionally cause an irritable condition of the skin which may last long, but it is exceedingly improbable that it is responsible for any substantial increase in the number of chronic skin diseases in children."

Also: "Amongst the inconveniences connected with vaccination is the production of contagious forms of eruption, such as have been classed under the names of porrigo and impetigo contagiosa. These eruptions are not attended by any risk to life, nor by any permanent injury to health, and they are usually curable by simple measures" (Sect. 418).

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[1] At the same time I regard vaccination in the case of sailors and soldiers as very necessary. Visiting countries where smallpox is rife, as they have to do, they are in a totally different category from the rest of the population. But it is *recent* vaccination that is required. Infantile vaccination is of little use.

They admitted the possibility of syphilis being communicated by arm-to-arm vaccination, but said that they had received no evidence whatever of any recent series of vaccino-syphilis cases in British practice.

The only comment I would make on this finding of the Royal Commission is to say that our estimate of the importance to be attached to the admitted injuries caused by vaccination will depend very much upon the importance we attach to vaccination as a preventive of smallpox. So long as smallpox was a serious menace from which we could be saved by vaccination, any injuries caused by vaccination were, in comparison, trifling. But if it be the case that smallpox has ceased, independently of vaccination, to be a serious menace, and if there is reason to believe that smallpox can now be effectively combatted without recourse to universal vaccination, then we must needs attach much more importance to the injurious effects of vaccination than was done at the time of the Royal Commission.

It is all very well for the Commissioners to state dispassionately that although some of the dangers of vaccination are "undoubtedly real and not inconsiderable in gross amount," yet "when considered in relation to the extent of vaccination work done they are insignificant." They might say with equal truth that the number of deaths or injuries from burning due to the wearing of flannelette is insignificant when considered in relation to the total number of children who wear flannelette ; or that the number of persons who fall victims to drink is insignificant in relation to the number of persons who use intoxicating beverages. Our estimate of the importance of an evil cannot be expressed as a numerical proportion of this kind. Moreover, it will not be much solace to the parent who has lost a child through vaccination, to assure him that the proportion of children who die from the effects of vaccination is only one in so many thousands vaccinated.

The Minority Report

The Minority Commissioners in their Report say :

"We are deeply impressed with the sad cases of severe illness and suffering and death which the investigations of medical men appointed by the Commission have, after rigid scrutiny, failed to disconnect from vaccination. We are also struck with the fact that under the circumstances which must obtain in the houses of the poor, additional risks to health and life are encountered, and that the operation cannot be regarded as free from even the more avoidable risks, except under conditions and precautions it is perfectly impossible to secure. To compel vaccination under such circumstances, even if its value were greater than it is, is in our opinion morally indefensible. It is with a sense of shame and amazement that we hear of instances in which parents who have lost one child from the effects of vaccination have been prosecuted and fined for refusing to submit another child to the operation.

"Drs. Barlow and Acland found that about half the cases of vaccinal injury investigated by them (93 out of 189) were of inflammatory or septic origin. . . .

"Among the thirty-two fatal cases investigated by Dr. Luff, in which vaccination was a determining cause or factor in the fatal event, there were twenty-two of erysipelas, three of cellulitis, three of septicæmia, three of pyæmia, and one from exhaustion.

"Dr. Coupland deals with injuries due to the quality of the lymph, and to septic infection, and adds a third category which he terms 'Cases of deranged health, and even serious symptoms, evolved by the constitutional disturbance induced by vaccination in weakly or predisposed subjects.' In reference to these cases he suggests that 'unless smallpox were prevalent at the time, it might often be preferable to defer vaccination for several months than to adhere too rigidly to the statutory age, irrespective of the condition of the child and its surroundings.' In particular, he deprecates the vaccination of very young infants, as is the practice in regard to workhouse children and those born in lying-in institutions. . . ."

Dr. Acland's Statistics of Deaths and Injuries

During the year following the issue of the Final Report of the Royal Commission an important work[1] was published by Theodore D. Acland, M.D., embodying the results of personal research into the question of vaccinal injuries which he made on behalf of the Local Government Board and the Royal Commission on Vaccination.

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[1] *Vaccinia in Man: A Clinical Study* (Macmillan).

The following extracts will serve to illustrate the scope of the work, and at the same time will, I think, give a moderate impression of the risks of vaccination up to the date in question (1897).

"The number of deaths or serious injuries which result annually from vaccination may be arrived at with considerable certainty. From the Registrar-General's returns it appears that in the years 1881–9 the number of deaths certified as connected with vaccination was 476, or nearly 53 a year. During these nine years 6,739,902 primary vaccinations were performed. This gives an average of one death to 14,159 primary vaccinations. . . ."

(Since 1899 the number of deaths registered as due to vaccination has happily declined somewhat, and from 1890–1910 inclusive the average as given in the Reports of the Registrar-General has been only 31·6.

It must be admitted, however, that the number of deaths actually certified as due to vaccination is always likely to be below rather than above the real figure, and in any case it gives no indication as to the number of cases where non-fatal injuries have resulted.)

Dr. Acland states that out of 626 cases of alleged vaccinal injuries investigated for the Local Government Board and the Royal Commission on Vaccination he came to the conclusion that some 495, or 80 per cent., were probably due to vaccination.

"From these statements it will be seen that, however valuable to the community at large, vaccination is not exempt from that liability to accident which exists in all human affairs. Operations even of a trivial kind sometimes prove fatal, and that most beneficent means of alleviating pain which has been universally adopted—the administration of anæsthetics—is not unattended by risk, and occasionally results in death. . . .

"It cannot be argued that the rare fatalities attendant upon vaccination which occur are sufficient ground for rejecting the practice if it can be proved to be beneficial on the whole. If the practice of vaccination is to be discredited, it must be by showing that the injury thereby inflicted on individuals is out of all proportion to the good which is gained by the community; and not by exaggerating, distorting, and multiplying every isolated instance of injury which occurs. The following pages have been written with the object of stating fairly what is the amount and kind of injury inflicted by vaccination as at present practised; how much of it is inevitable, how much preventable, and by pointing out the dangers, to show incidentally how many of the risks may be avoided.

"*In this, as in other branches of pathology, it is incumbent on the medical profession to impose on itself, as a condition of assenting to any doctrine, the obligation of setting forth conscientiously all that can be said against it, no less than all that can be said in its favour. . . .*" (Italics added.)

"*Eczema.*—Vaccination is performed, in the majority of cases, at a period of life when eczema and other inflammations of the skin are extremely common; and it is no wonder that the operation is sometimes followed by an acute outbreak of such disorders. I have not met with any case in which it seemed probable that the infection was transmitted by the operation; and in many cases which have come under my own observation, or which have been recorded by others, the acute attack following vaccination or injury to the scab is merely a recrudescence of a pre-existing condition, or is an expression of a family tendency. Out of a total of 394 cases of alleged vaccinal injury which have more or less directly come under my own notice during the last eight years, thirty, or about 7·5 per cent., were cases of non-specific skin eruptions; and there does not seem to be any reason to suppose that vaccination is the specific cause of any large number of severe cases of eczema."

Whilst accepting Dr. Acland's authoritative pronouncement, it cannot be denied that even slight cases of eczema (which, though not perhaps "specifically" caused by vaccination, have presumably been originated or recalled into existence by vaccination) are often very intractable and may give rise to much discomfort and worry. I have one such case in my mind where a lady—a connection of my own—suffered for over twelve months with an intensely irritable condition of the skin of the arm in the neighbourhood of the place where she was re-vaccinated, and was under treatment for much of that time.

"*Impetigo or Porrigo.*—The occurrence of this contagious affection of the skin after vaccination is little to be wondered at when the conditions under which the children of the poor have to live are taken into consideration. . . . It is unnecessary to discuss this question at length; it cannot be doubted that impetigo may follow any wound, vaccinal or other, in which pus is formed; and the liability to infection is enormously increased by want of cleanliness and bad hygienic surroundings. . . ."

(I do not feel that vaccination should be exonerated merely because bad results following the operation are largely due to unhygienic surroundings. The poor cannot usually escape from their surroundings, and without the wound inflicted by vaccination the bad results would not have followed.)

Erysipelas.—Dealing with the question of erysipelas Dr. Acland writes: "Among the complications of vaccination, those are most to be dreaded which are common to all wounds. The most grave are erysipelas, cellulitis, ulceration, abscess, and septicæmia. None of these are peculiar to vaccination; they constitute the dangers of any local lesion of the skin; and, considering the age of the children vaccinated, the conditions under which thousands of them live, and the treatment to which, in defiance of the most elementary principles of cleanliness, the wounds are often subjected, it is surprising that, as investigation proves, so few cases of serious injury occur. . . .

"It is possible that the virus of erysipelas may be, and sometimes, though rarely, is introduced with vaccination; but no proof has been brought forward to show that the vaccine lymph commonly contains this virus, or that erysipelas is a necessary or essential part of vaccination. . . ." (pp. 32–5.)

Dr. Acland mentions a case where "eleven children were vaccinated on the same day; in one case only two pocks formed, and on the eighth day the child was re-vaccinated from one of his co-vaccinees, in two places. Both these children, who lived many miles apart, and as far as I could ascertain never met again, and were not attended by the same doctor, sickened with erysipelas within twenty-four hours of one another about the twenty-sixth day after vaccination, and died within four days of one another, thirty-nine and forty days after vaccination respectively." In another case the vaccinator, apparently ill at the time, died of erysipelas four days after inspecting a child's arm which was inflamed. The child died four days later, also of erysipelas.

"In the following cases of vaccinal erysipelas there is sufficient evidence for concluding that the lymph or method of vaccination was the actual cause of the disease.

"Two children were vaccinated with lymph stored in tubes; both of these children died with symptoms of general diffuse inflammation of the skin which spread over the entire body. In the first child the inflammation was well marked by the third day; in the second child the first vaccination failed entirely, but it was re-vaccinated from the same source: 'soon' after the second vaccination the arm became red and swollen, and by the fourth day the inflammation had spread to the elbow."

"Apart from any intrinsic qualities in the lymph, and independent of all sources of danger from the methods employed in its collection and storage, there are elements of extraneous and often readily avoidable risk in the circumstances of the infant, and in the method in which the operation is at times performed. The use, in one case, of a mechanical scarifier which it was practically impossible to clean, and, in another, of ivory points which had frequently been recharged, may be instanced.

"Hypotheses concerning the nature of vaccinal erysipelas which do not take these and such cases into account are likely to be fallacious. The facts are that erysipelas is common in infants, especially as a result of open wounds; and that vaccination acts as nothing more than an exciting cause, not infrequently providing the starting-point.

"*Vaccinal Ulceration and Glandular Abscess.*—Of the other inflammatory complications which may follow vaccination, those of the most frequent occurrence are ulceration at the point of inoculation, and glandular abscess. Nearly 4 per cent. of the vaccinal injuries inquired into by the Local Government Board (1888–1891) were due to one or other of these lesions; and in all the cases some extraneous cause was found which might have determined the departure from the normal. . . ."

"*Gangrene at the Point of Vaccination.*—In isolated cases gangrene occurs at the point of vaccination, and it sometimes follows vaccination in syphilitic subjects. One such case is reported by Balzer; one by Wheaton. I have myself investigated two cases, in one of which the syphilitic parentage is certain and in the other probable. It is not unreasonable to suppose, if the individual vaccinated be the subject of inherited disease, and the operation be performed when the child is very young, that the result is largely due to the condition of the tissues, and not necessarily to any abnormal quality of the lymph.

"*Septic Infection in Relation to Various Kinds of Lymph.*—There are no accurate data for determining whether erysipelas and the septic infections are more common after the use of calf lymph, or humanised lymph ; or of lymph stored in tubes, on points, or as a conserve.

"It has been thought that the use of 'calf lymph' might afford some increased security against these inflammatory complications ; and this supposition seemed to be corroborated by the fact that diffuse inflammation around the pocks in calves is rarely observed. . . .

"Reliance must not, however, be placed on the comparative insusceptibility of the calf to erysipelas and septic infections through superficial wounds, to secure the immunity of vaccinated children from erysipelas. Most of the inflammatory sequels of vaccination, if not all, are due to causes which are removable, and therefore, under certain conditions, preventable ; the lymph itself rarely contains organisms capable of directly causing erysipelas, and it is probable that all pyogenetic organisms can be removed from the lymph, by treating it with glycerine. . . .

"The result of my own observation leads me to the conclusion that vaccination, as now performed directly from the calf, is, *cæteris paribus*, followed by greater inflammatory reaction than when humanised lymph is used ; but, as stated above, there are no trustworthy figures to show the percentage of cases of erysipelas or cellulitis which follow vaccination by either method."

Vaccination and Syphilis.—This chapter would be incomplete without some reference to the unsavoury question of vaccinal syphilis. For a long time medical men were sceptical as to the possibility of syphilis being inoculated at the time of vaccination. In fact, it was confidently asserted that it was impossible. In a pamphlet,[1] revised by the Local Government Board, and at one time extensively circulated, it was stated :

"The fear that a foul disease may be implanted by vaccination is an unfounded one. Such mischief could only happen through the most gross and culpable carelessness on the part of the vaccinator; and as all medical men now receive special training in vaccination, no risk of this kind need be at all apprehended. Of course, vaccination, like everything else, requires a reasonable amount of care in its performance. *The alleged injury arising from vaccination is, indeed, disproved by all medical experience.*" (Italics added.)

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[1] *Facts Concerning Vaccination for the Heads of Families.*—In the same pamphlet it was also stated : "As to the alleged injuries from vaccination, all competent authorities are agreed that, with due care in the performance of the operation, no risk of any injurious effects from it need be feared."

This pamphlet has, of course, long since been withdrawn. The possibility of conveying syphilis by vaccination, so long as arm-to-arm vaccination was continued, is now fully admitted. Nor is such a disaster now regarded as necessarily the result of carelessness. As Sir Jonathan Hutchinson said: "It is absurd to assert that inherited syphilis is always to be detected, and it is a cruel injustice to imply that all accidents (of this kind) have been the result of carelessness." It is frankly admitted now that a syphilitic infant may be infectious and capable of transmitting the infection of syphilis through lymph taken from it, before manifesting any outward symptoms of the disease.

The late Sir Thomas Watson, F.R.S., President of the Royal College of Physicians, alluding to this risk, said: [1]

"I can readily sympathise with, and even applaud, a father who, with the presumed dread or misgiving in his mind, is willing to submit to multiplied judicial penalties rather than expose his child to the risk of an infection so ghastly."

Undoubtedly the record of the injuries which have been caused by vaccination constitutes painful reading, and the recollection of the past should make medical men more tolerant of the opposition to vaccination than is sometimes the case. Especially is this so when we reflect that many of the dangers connected with vaccination, though undoubtedly greatly minimised, still exist at the present day, and are not likely ever to be entirely abolished. Moreover, whilst the risks of vaccination have been diminished, so have the risks of smallpox to an even greater extent. After all is said, the question reduces itself to a choice of evils.

The anti-vaccinists may be greatly in error in many of their assertions; their scepticism as to the protective influence of vaccination upon the individual may be entirely misplaced; they may greatly exaggerate the risks of vaccination, especially as performed under present-day conditions; but nevertheless,

[1] *Nineteenth Century*, June, 1878.

any one who studies this aspect of the subject dispassionately must admit, I think, that at least there is some ground for their hostility and opposition to vaccination.

Concluding Remarks on Vaccinal Injuries

Having thus enlarged somewhat upon the injuries caused by vaccination, it is desirable, before concluding, to say a word in order to restore the perspective, so to speak, and correct any exaggerated impression which may have been conveyed.

In the first place, then, we must bear in mind the enormous number of vaccinations performed, viz. over half a million yearly. Probably a careful vaccinator performs many hundreds, possibly thousands, of vaccinations without seeing a single case of serious injury.

Secondly, the risks of vaccination are certainly less, as we have shown, than they used to be. The number of deaths registered annually as due to vaccination has diminished over 50 per cent. No doubt this is largely due to improved methods and more stringent precautions. The introduction and universal adoption of antiseptics have certainly made the operation much safer.[1]

Further, it should be pointed out that there are no diseases of any practical importance, apart from those which have been referred to—I believe I am justified in saying this—which can reasonably be attributed to vaccination. I am well aware that it has often been alleged by anti-vaccinists that almost every kind of constitutional disease may be induced by vaccination, but I do not know of any satisfactory evidence to support the allegations.

Lastly, the risk of syphilis being conveyed by vaccination is entirely abolished by the abandonment of arm-to-arm vaccination. The suggestion that vaccinia is in itself an analogous disease to syphilis and closely akin to it in its nature does not appear to me to merit serious discussion.

At the same time the fact remains that there are certain definite risks attaching to the practice of vaccination. However carefully the operation is performed it is impossible to guarantee that no bad effects will follow. Consequently I feel justified in saying that universal vaccination and re-vaccination and re-re-vaccination, whilst it may have been expedient and necessary in the past, cannot be regarded as an ideal method of preventing smallpox. Those who urge its adoption ought certainly to be prepared to prove that no alternative method is adequate. Can they do this, so far as this country is concerned, in the light of the experience which has been obtained in recent years?

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[1] It is true that there has been a reduction in the total number of vaccinations performed, but this would only account for part of the reduction in the deaths. Another factor of a different kind which may account for some of the apparent reduction is the altered method of classification now adopted by the Registrar-General of deaths connected with vaccination.

CHAPTER XII

CONCLUSION

The Future Outlook—Emergency Vaccination—Practicability of Vaccinating an Entire Community as a *dernier ressort*—How to Improve the Alternative Means of Defence—The Danger of Unrecognised Cases—Lack of Medical Skill in Diagnosis—The Remedy—Germany and Great Britain—Vaccination still Necessary in Special Cases—Conclusion.

The Future Outlook

It is impossible to conclude our review of the vaccination question without referring to the future. The future, indeed, is the crux of the whole issue. Infantile vaccination is being increasingly neglected; more and more children are growing up un-vaccinated; what are the prospects of the country as regards its liability to smallpox?

The orthodox view, held by most Medical Officers of Health, is that there is a grave danger of smallpox returning in widespread epidemic form and causing a terrible mortality as was the case in the pre-vaccination era (*v.* Appendix IV.).

Undoubtedly, many have a genuine fear that if smallpox once succeeded in obtaining a foothold in an un-vaccinated community it would spread "with a rapidity of which we have in recent times had no experience."

I realise that any one who suggests that this view is unduly alarmist incurs a certain measure of responsibility, and I believe that this reflection has hitherto deterred those who might otherwise have been inclined to express a more sanguine view. Personally, having been Medical Officer of Health for thirteen years in a town which, for practical purposes, may be regarded as un-vaccinated; living and moving, as I do, amongst a child population 90 per cent. of which is un-vaccinated, I feel unable to subscribe to this pessimistic view. I believe that the sanitary condition of the country has been so greatly improved, and alternative measures for dealing with smallpox have been so highly evolved, that we shall never revert to the state of things which existed in the days before vaccination was discovered.

I think that the facts and considerations which have been set forth in the preceding chapters justify a much more optimistic outlook than is usually taken by pro-vaccinists.

In my opinion, the value of infantile vaccination in checking the spread of smallpox in a civilised community has been greatly over-estimated. I believe also that in reality there is much less difference as regards susceptibility to smallpox between a so-called "well-vaccinated,"[1] and a badly vaccinated town. In any case it is only the children that are efficiently protected by infantile vaccination, and I have tried to show that, under modern conditions, children play a comparatively small and unimportant part in disseminating the disease. Un-vaccinated children who are attacked by smallpox should be regarded as *victims* rather than as *causes* of an epidemic. The chief factor in the dissemination of smallpox at the present day is undoubtedly, as we have seen, the unrecognised case. Get rid of this and you will have virtually abolished smallpox epidemics.

Emergency Vaccination

Moreover, in abandoning infantile vaccination *we are by no means abandoning vaccination altogether.* In fighting smallpox—as distinct from any other epidemic disease—we have at our disposal a unique and infallible weapon which robs an epidemic of smallpox of much of the terror with which it would otherwise inspire us—I refer to *emergency vaccination.*[2] This is of two kinds: (*a*) Vaccination after exposure to infection, *i.e.* vaccination of "contacts." This measure has the great virtue of being applied just where it is most wanted. Provided only that the first case is promptly recognised, as it should be, it enables us almost with certainty to prevent the infection from spreading further. (*b*) Universal vaccination of the population in the presence of a serious epidemic. This would only be resorted to in the event of other measures having failed, and the epidemic having got "out of hand" and threatening to become really dangerous. Provided that such a measure could be efficiently and promptly carried out, it would cut short the most virulent epidemic with certainty in three weeks. The question then arises, is such a measure reasonably practicable? I believe that it is. The first necessity, of course, is a sufficient supply of vaccine. In the old days of arm-to-arm vaccination this would have been unobtainable. To-day, with calf lymph and cold storage, there would be no difficulty whatever. The Government always keeps vast quantities of lymph in stock, and an almost unlimited supply can be obtained at any time by telegraph.[1] The chief difficulty at the present time would probably be the opposition of the public, owing to the very widespread prejudice which exists against vaccination. This prejudice, however, is an equal difficulty in the case of the alternative measure of infantile vaccination, and it has certainly been largely engendered by the compulsory vaccination law. It is reasonable to believe that if compulsion were entirely abandoned organised opposition would soon die a natural death and prejudice would largely disappear.

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[1] I am not referring to re-vaccinated towns, of which we have none in this country.

[2] There is also vaccination of smallpox staff, an administrative measure of the utmost value and importance.

Moreover, the very fact that such universal vaccination as we are now contemplating would only be resorted to in the presence of real and immediate danger would certainly go far to overcome any opposition which might exist.

The universal vaccination of an entire population as an emergency measure is then, I contend, a reasonably practicable measure, provided that there is no widespread hostility to the operation. No doubt it would be a somewhat drastic step to take, but the chances of its ever being required are very remote. Nevertheless, the mere fact that we have such a measure to fall back upon as a last resource in the event of other measures failing makes all the difference in considering the future outlook, supposing infantile vaccination were to be entirely abandoned.

How to Improve the Alternative Means of Defence

It remains for us to consider how far we can perfect and improve the other means at our disposal and strengthen the weak places in our armour in order to be the better prepared to meet the enemy.

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[1] Dr. Reece stated recently that the Government kept over half a million tubes of calf lymph in reserve in cold storage for emergencies, and that a thousand tubes could be sent to any part of the country on receipt of a telegram (*Proceedings of the Royal Society of Medicine*, 1912).

Hospital Accommodation.—No doubt there are still many towns and districts where the hospital accommodation for treating smallpox is not only very inadequate, but is also unsuitable. One common defect is that of situation, the hospital being placed too near to populous localities. It is the smaller County Boroughs [1] which are least well prepared. In such cases, should a serious outbreak of smallpox occur, it is very probable that the existing accommodation would quickly become exhausted, and unless it were promptly supplemented cases would have to be left at home and a complete breakdown, such as was experienced at Dewsbury, Gloucester, and elsewhere, might easily occur. Now that smallpox is such a rare visitor and epidemics so uncommon it is becoming more and more difficult to prevail upon local authorities in these smaller districts to make provision against an outbreak of the disease. Nor is it very reasonable to expect every sanitary district to maintain a large empty hospital which will rarely if ever be required. It was suggested in Chapter X. that smallpox should be regarded as a national enemy, and that the Government should assume responsibility for dealing with it at whatever point it may succeed in obtaining a footing, provided the local authority is not capable of dealing with it single-handed. I suggest that the Local Government Board should be prepared to render prompt assistance of a practical kind to any local authority in danger of being overpowered; and such assistance should include portable hospital accommodation, motor ambulances, nursing staff, expert medical officers, etc. Nor should the Board wait to be approached by the local authority; but should act at once on their own initiative when necessary. An epidemic out of control in any part of the country is a serious menace to the rest of the country.

It may be desirable that the Local Government Board should obtain increased powers to enable them to take such action as has been suggested, and these might include power to commandeer the available hospital accommodation of other authorities.

The Danger of Unrecognised Cases.—We have considered the great danger arising from unrecognised cases, and we have seen that these cases usually occur in vaccinated persons who have become de-vaccinated. As infantile vaccination becomes less and less resorted to, there will be of course a diminishing proportion of such de-vaccinated persons in the population, but there are always likely to be some, and these will constitute a constant danger to the un-vaccinated. It might, therefore, be desirable in abandoning compulsory infantile vaccination to make re-vaccination compulsory (say, on leaving school) for all children whose parents had elected to have them vaccinated in infancy. There should be little difficulty about this, as it would only concern those parents who were, presumably, in favour of vaccination.

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[1] The County Councils provide for the Municipal or non-County Boroughs.

Lack of Medical Skill in Diagnosis.—Failure on the part of medical men to recognise smallpox is undoubtedly a very serious, but at the same time an essentially preventable cause of the spread of smallpox. We have repeatedly had occasion to refer to outbreaks of smallpox causing much illness and loss of life which were entirely due to the fact that the medical man called in failed to diagnose the disease.

Yet smallpox, of all the epidemic diseases met with in this country, is the one in which a positive diagnosis can be made in very nearly every case, and in which mistakes ought not to be made.

Whilst saying this I do not mean to imply that real difficulty does not sometimes occur, or that even the most careful and expert diagnostician may not occasionally be deceived. But the great majority of the cases in which mistakes are made are not of this class, but are cases in which the practitioner ought at least to have *suspected* smallpox. For it must be observed that the medical attendant is not really called upon to make a final diagnosis. He can always, if in doubt, call in the Medical Officer of Health, and place on him the responsibility of deciding whether a case be smallpox or not.

What then is the explanation of the frequent failure on the part of "qualified" medical men to diagnose smallpox? The answer is simple. It is that medical students do not have the immense importance of this particular subject sufficiently impressed upon them, nor is adequate attention paid to it either in the lecture hall or in the examination room. The facilities for clinical instruction and the opportunities for becoming practically familiar with the disease are admittedly very few. Smallpox has become so rare a disease in this country that a medical student may never see a case during the whole course of his student career. Moreover, as the examiners themselves rarely, if ever, come across the disease, it is not surprising that they have not hitherto attached much importance to the question of its differential diagnosis. It may easily happen, therefore, as matters stand at present, that not only does a medical student see no case of smallpox, and pay little attention to the study of the diagnosis of the disease, but he may get through his final examination without being asked a single question about it. He is then turned loose upon the country as a "fully qualified" medical practitioner, although woefully ignorant on a subject which is of the most vital importance!

To quote Dr. T. F. Ricketts, Medical Superintendent of the Smallpox Hospitals of the Metropolitan Asylums Board:

"I think it may be said justly that the most part of the cases of smallpox which occurred in London last year (1900) might have been prevented very readily. Had the mistakes in diagnosis which I have recounted not been made, so much illness, much suffering, and some deaths would have been avoided. Smallpox is a disease which in practice seems to present more difficulties in its detection than do most others; it is the disease in which mistakes are of most moment; and yet it is perhaps, of all diseases, that in which a certain diagnosis can be arrived at in almost every case."[1]

The public may well ask to what purpose has the medical profession been granted the very special privileges which have been so liberally accorded it; to what purpose is there the closely guarded door to the medical profession, and the compulsory five years of study; and to what purpose has the General Medical Council been granted the plenary powers for regulating medical education and the conditions of obtaining diplomas, if there has been this conspicuous failure to safeguard the paramount interests of the community in this matter of adequate knowledge, on the part of legally qualified medical practitioners, in the diagnosis of smallpox?

The Remedy.—It may be urged that there are difficulties in the way of ensuring that medical students shall obtain this knowledge. The answer to this is that difficulties are made to be overcome, and in this case they are far from being insurmountable. If the General Medical Council would only ordain that every medical student in his final examination had to "pass" in the diagnosis of smallpox as a special subject, ways and means for obtaining the necessary knowledge would quickly be devised[1] and the whole situation would be radically changed.

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[1] *Annual Report to M. A. B.*, 1900.

It is scarcely necessary to add that failure on the part of a medical man to diagnose smallpox not only damages his own reputation and injures his practice, but it brings discredit upon the whole Profession.

Germany and Great Britain Compared

As regards Germany, I will say frankly that I quite admit that a system of universal vaccination and re-vaccination and re-re-vaccination, where it can be effectually enforced, will practically abolish smallpox. Just how far Germany's present freedom from smallpox is due to her complete system of vaccination, and how far to her advanced sanitation, may be a debatable point, but I will assume for the sake of argument that it is due to vaccination. We find, then, that Great Britain, having perfected her system of sanitation and alternative preventive measures, is enjoying just as great a measure of freedom from smallpox (during the past decade) as is Germany with all her vaccination. Germany has abolished smallpox by substituting a very great deal of vaccination; Great Britain is making for the abolition of both smallpox and vaccination.

Vaccination still Necessary in Special Cases

There will still be a necessity for vaccination, however, in the case of certain classes and individuals who are specially liable to exposure to infection, *e.g.* medical men, nurses, and sanitary officials; also persons who have to visit foreign countries where smallpox is rife, including our soldiers and sailors. But it is *recent* vaccination and not infantile vaccination that is required in all these cases.

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[1] Smallpox is a disease which readily lends itself to instruction by means of photographs, diagrams, and models. The magnificent illustrations to Ricketts and Byles' work on the subject of smallpox, many of them stereoscopic, and some photographed in natural colours, are sufficient for the purpose, but could, of course, be added to. I should like to suggest that a set of these illustrations should be framed, and constitute part of the teaching equipment of every medical school. Exact reproductions in wax similar to what are already in existence for many rare skin diseases might also be prepared and would be of the utmost value for teaching purposes.

Conclusion

In conclusion, let me say that if the measures at present being employed so successfully against smallpox be perfected, and their employment made more universal; if the unfortunate defect in medical education which we have pointed out be remedied; if the Government will undertake to come to the assistance of local authorities whenever necessary; then I venture to submit that there should be little real cause for alarm as to the future prospects of this country in relation to smallpox even though infantile vaccination falls more and more into disrepute. The conditions would be totally and essentially different from what they were in the pre-vaccination era when the disease was a pestilence and a scourge.

Inefficient Vaccination.—It has been alleged by pro-vaccinist apologists that one chief reason for the failure of infantile vaccination to protect is the inefficient manner in which it is sometimes performed. This allegation is based on the fact that some private medical practitioners are content to vaccinate in one or two places only instead of complying with the standard laid down by the L.G.B. for public vaccinators of four insertions with a minimum combined area of half a square inch.

Personally, I have always felt that too much importance was attached to "area" and number of "marks." It is true that statistics show that the duration of protection is somewhat greater with "good" vaccination, but after all the great cause of the failure of vaccination to protect is *lapse of time*, and recent vaccination, even though performed in only one small place, is infinitely more trustworthy than vaccination performed many years before, no matter how "thoroughly" performed. In any case, this alleged "inefficient" vaccination, where it exists, is almost confined to private vaccinations, so that the total amount cannot be great. Moreover, there is after all a good deal to be said in favour of reducing the constitutional disturbance caused by vaccination in a young infant as much as possible, and there are many cases where I should be inclined to advise only one or two insertions in preference to three or four. But whether the insertions are few or many, parents would always be well advised to have the operation repeated after the lapse of a few years if any special risk of smallpox should chance to arise.

APPENDICES

PAGE

I. SOME CHARACTERISTICS OF SMALLPOX WHICH DISTINGUISH IT FROM OTHER ZYMOTIC DISEASES . 195

II. COMPARISON BETWEEN VACCINATION AND SMALLPOX INOCULATION 197

III. SYNOPSIS OF PRINCIPAL EVENTS IN THE HISTORY OF VACCINATION AS A STATE INSTITUTION . . 199

IV. WARNINGS BY MEDICAL OFFICERS OF HEALTH AS TO DANGER OF NEGLECTING INFANTILE VACCINATION 201

V. STATISTICAL PROOF OF THE EFFECT OF VACCINATION IN MODIFYING SMALLPOX 206

(1) Bristol. (2) Bradford. (3) Manchester.

VI. (1) PARTICULARS OF OUTBREAKS OF SMALLPOX OCCURRING IN LEICESTER IN 1902 . . . 209

(2) STATISTICS OF SMALLPOX IN LEICESTER, 1903–1904 213

VII. FURTHER ILLUSTRATIONS OF THE DANGER OF UNRECOGNISED CASES OF SMALLPOX MODIFIED BY VACCINATION 223

(1) Bristol.
(2) Manchester
(3) Salford.
(4) Newcastle-on-Tyne.
(5) Nottingham.
(6) Oldham.
(7) Bootle.
(8) Leeds.
(9) Glasgow.
(10) South Shields.
(11) Cambridge.

APPENDIX I

SOME CHARACTERISTICS OF SMALLPOX WHICH DISTINGUISH IT FROM OTHER ZYMOTIC DISEASES

1. Infectivity.

(*a*) Smallpox is intensely infectious, though its infectiousness depends upon conditions which are not altogether understood.

(*b*) The infection is conveyed aërially,[1] *i.e.* for a considerable distance through the open air.

(*c*) Apparently the infection (as a general rule) soon loses its activity after it has left the human body.

(*d*) It is not, as a rule, infectious before the eruption appears. This is a most important fact, as the nature of the disease can always be recognised, or at least suspected, as soon as the eruption comes out, and precautions can then be taken to prevent the infection from spreading. In this respect smallpox differs notably from measles, with which it has often been compared.

2. Smallpox has very definite symptoms and a highly characteristic eruption. For this reason it is the easiest of all the acute zymotics to diagnose.

3. The onset of smallpox is sudden and sharp—not insidious like enteric—and the patient becomes so ill that almost always he has to take to bed at once and call in a doctor. The " contacts " are therefore usually limited to members of the household and to such persons as may have visited the house.

4. Smallpox is such a serious disease that it is much dreaded by

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[1] *Aërial Infection.*—I regard the possibility of aërial infection of smallpox as completely proved. The fact that a certain amount of negative evidence exists against the theory does not in any way disprove it. Aërial infection probably depends upon certain subtle atmospheric and other conditions, at present ill-understood, and no doubt it is very uncertain and variable in its operation. I am inclined to think that the possibilities and importance of aërial infection have been under-estimated rather than the reverse. It may be necessary to increase the distance of smallpox hospitals from populous areas, or to modify existing methods of treatment. Possibly universal antiseptic inunction of smallpox patients might be effectual in preventing aërial infection.

the public. This greatly facilitates the taking of precautions, and thereby makes it easier to limit the spread of infection.

5. Influence of recent successful vaccination on smallpox.

In spite of the intense infectivity of the disease, we have in recent vaccination a practically infallible means of protecting those who have to come in contact with it.

Moreover, even though vaccination be performed after exposure to infection (provided it be not postponed later than the third or fourth day), it will still be in time to confer its protection. This beneficent fact is due to the incubation period of vaccinia being so much shorter than that of smallpox, and it usually enables us to limit an outbreak to the first case, provided always that such case be at once recognised.

6. Smallpox is not endemic in this country. It is an exotic, and it disappears entirely from localities for long periods of years. It never reappears unless introduced from outside. There is no reason why it should not be banished entirely, provided only that chance importations from abroad can be promptly got hold of and proper measures of prevention applied.

The outcome of these characteristics of unmodified smallpox is that we have a disease liable to cause widespread, rapidly extending, and fatal epidemics if left to itself, but one which is remarkably amenable to scientific preventive measures. It is probably more open to control than any other zymotic disease commonly met with in this country.[1]

Modified Smallpox

In smallpox modified by vaccination many of the characteristics and distinctive features of the natural and unmodified disease are profoundly altered. The disease becomes difficult to diagnose and is easily overlooked. Consequently the difficulty of controlling an epidemic and preventing the spread of infection is in this respect greatly increased.

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[1] This assertion is made irrespective of the condition of a community as regards infantile vaccination.

APPENDIX II

A COMPARISON BETWEEN VACCINATION AND SMALLPOX INOCULATION

VACCINATION is greatly superior to inoculation as a practical preventive measure, because it is non-infectious. There are, however, many points of resemblance between the two.

Inoculation	*Vaccination*
1. The underlying principle of smallpox inoculation consists in the giving of a mild form of disease in order to confer immunity against a more severe form.	1. The same principle applies to vaccination.
2. Inoculation confers complete temporary immunity against smallpox, but (probably) this is not so lasting as the immunity conferred by a natural attack.	2. Vaccination has the same effect.
3. After the immunity against attack has begun to wear out, the effect of inoculation still greatly modifies the severity of an attack of natural smallpox if contracted.	3. Vaccination has the same effect.
4. Inoculation would necessarily tend to alter the age-incidence of smallpox mortality.	4. The altered age-incidence of smallpox mortality is a well-known effect of vaccination.
5. Inoculation was more popular with the well-to-do classes than with the poor, who were inclined to be "prejudiced" against it and to regard it with suspicion.	5. Vaccination has usually been more popular with the well-to-do classes than with the poor.
6. When first introduced inoculation was believed to be an unmixed blessing. Exaggerated views were held as to its utility, and attempts were made to encourage the universal adoption of the practice. The "better classes" were called upon to set a good example to the poor and ignorant.	6. The history of vaccination is similar.

7. After a time certain drawbacks and dangers attending its use were discovered, and inoculation began to fall into disrepute.	7. History of vaccination again similar.
8. It is now recognised that whilst inoculation undoubtedly protected the individual, its effect upon the community was just the opposite, in that it actually tended to spread smallpox.	8. It is now beginning to be recognised that whilst vaccination undoubtedly protects the individual, its effect upon the community is much more uncertain, and that it may under certain circumstances actually tend to encourage the spread of smallpox.
9. Persons who had been inoculated proved to be a danger to those who had not been inoculated.	9. Persons who have been vaccinated, but whose vaccination has partially worn out, are often a very serious danger to those who are un-vaccinated, or to those whose vaccination has entirely worn out.
10. But it would be very unreasonable to suggest that those who neglected to get inoculated were a danger to those who were inoculated.	10. Similarly it seems rather unreasonable to suggest that persons who have neglected to get vaccinated are a danger to those who have been vaccinated.
11. Even if vaccination had never been discovered as a substitute for inoculation, we may conclude that the general use of inoculation would have been abandoned as soon as its limitations and drawbacks were realised and it was discovered that smallpox could be effectually controlled by other means.	11. It seems probable that the general use of vaccination will be largely abandoned as its drawbacks and limitations become more fully realised, and when it is discovered that it is possible to effectually control smallpox by other means.
12. But nevertheless inoculation would have continued to render invaluable service in protecting smallpox nurses and others specially exposed to infection.	12. In the same way vaccination will always continue to render invaluable service in protecting smallpox nurses and others specially exposed to infection.

APPENDIX III

SYNOPSIS OF PRINCIPAL EVENTS IN THE HISTORY OF VACCINATION AS A STATE INSTITUTION

1798. Jenner's *Inquiry into the Causes and Effects of Variola Vaccinæ* published.
1807. National Vaccine Establishment founded.
1838. 19,000 cases of smallpox in London.
1840. Medical Society petitioned House of Lords to prohibit inoculation and provide free vaccination.
1840. Vaccination Act passed. Inoculation made a penal offence. Duty of appointing Public Vaccinators placed on Boards of Guardians.
1841. Vaccination Act passed amending Act of 1840 in certain minor particulars.
1853. Vaccination Act passed making vaccination of every child compulsory (unless certified as unfit) under penalty of 20*s*.
1855. Memorial to the General Board of Health advocating extension of practice of vaccination.
1861. Vaccination Act passed to facilitate proceedings before Justices.
1866. Deaths from smallpox in London numbered 1,389.
1867. Vaccination Act passed. Repealed and consolidated existing vaccination legislation; is still the principal Act at the present day; enlarged the scope of previous enactments; provided for the appointment of Vaccination Officers to enforce the law.
1871. Smallpox again becoming very prevalent.
1871. Vaccination Act passed making the appointment of Vaccination Officers compulsory.
1875. Public Health Act passed. Inauguration of the "Sanitary Era."
1888. Bill brought in to abolish compulsory clauses of Vaccination Act; it failed to pass.
1889. Royal Commission on Vaccination appointed.

1896. Royal Commission issued Final Report recommending modification of compulsion by recognition of "Conscientious Objector."

1898. Vaccination Act passed recognising the "Conscientious Objector."

1903. Departmental Committee appointed to inquire into cost of public vaccination, which had become very heavy. This Committee reported in 1905.

1907. The Local Government Board issued an order reducing the minimum fees for vaccination.

1907. Vaccination Act passed enabling father to obtain exemption by making a statutory declaration in place of having to go into Court.

1908—1914. As a result of Act of 1907, vaccination becoming more and more neglected. Result not so disastrous as was anticipated. Mortality from smallpox continues to decline and has become a negligible quantity.

(The facts given in the above synopsis have been largely taken from an article on Vaccination by Dr. W. McC. Wanklyn published in *Public Health*, December, 1913.)

APPENDIX IV

WARNINGS BY MEDICAL OFFICERS OF HEALTH AS TO DANGER OF NEGLECTING INFANTILE VACCINATION

THE following extracts (from the reports of medical officers of health) are taken from *The Jennerian* (the Vaccination Supplement to *The Medical Officer*) for 1913. They illustrate the present attitude of many medical officers of health towards the question of vaccination.

BILSTON

The medical officer of health of Bilston writes: "The increase in the so-called 'conscientious objections' continues to an alarming degree, and is bound to reap a disastrous harvest of victims ready for smallpox when next this loathsome disease appears in the country."

YORKSHIRE (WEST RIDING)

Dr. J. R. Kaye (C.M.O., West Riding, Yorkshire) writes: "Many of the reports call attention to the steadily increasing proportion of 'conscientious objectors,' and Dr. Sutherland, of Cleckheaton, points out that 'it is now less trouble to omit vaccination than to have it done.' Dr. Scatterty mentions that at Keighley '90 per cent. of the children and 98 per cent. of the adults have not even the protection afforded by primary vaccination.' Medical officers of health who have had experience of smallpox epidemics in the past are careful to state that they cannot be responsible for keeping the disease in check if it once gets a foothold under the present conditions; and Dr. Anderson, of Wortley, writes: 'It may confidently be predicted that the next epidemic will assume proportions not seen in this country for many decades.'"

CUMBERLAND

Dr. F. H. Morison, county medical officer, Cumberland, reports as follows: "Past experience has shown that an epidemic is preceded, it may be for several years, by odd cases occurring now and then in different areas. Such cases have been occurring for some considerable time, and I venture to predict that before very long this country will be visited by an epidemic of smallpox such as has not been seen since the pre-vaccination days. Warnings have been given time after time to this effect, but it would appear that nothing short of a severe epidemic will make people realise that there is only one protection against smallpox—namely, efficient vaccination of children and re-vaccination of adults."

WHITEHAVEN.—Dr. Fisher says: "I have in previous reports referred to the absence of separate hospital accommodation for smallpox in the borough. A time will surely come when this deficiency will be severely felt. . . . It is too much, however, to expect that when smallpox breaks out again—as it is certain to do under the present inadequate vaccination laws—it will be possible to treat smallpox and other infectious diseases concurrently with any reasonable hope of success."

ASPATRIA.—Dr. Briggs says: "Our population is becoming more pronouncedly each year an un-vaccinated one, and to such the disease proves very fatal."

HARRINGTON.—Dr. Cullen says: "I am no alarmist, but I think, from experience gained as a public vaccinator, that we will have a very rude awakening one of these days from a visitation of this dread disease, owing to the number of un-vaccinated children in our midst. During the past few years the number of un-vaccinated children has risen to quite 40 per cent., if not more, in my district, to say nothing of what is going on all over England, owing to the absurd and easy manner in which exemptions can be obtained."

EDMONTON URBAN DISTRICT

Dr. Sidney C. Lawrence writes: "A satisfactory feature of the infectious returns for 1912 is the absence of smallpox from amongst them; since 1904 the district has enjoyed a complete immunity from this disease. An epidemic of this dreadful disease is overdue, and judging from the returns of the vaccination officer there are many Edmonton children unprotected from infection, and sure to die if attacked."

DEVONSHIRE

Dr. George Adkins, C.M.O., writes: "The decline in the number of vaccinated children attending the public elementary schools continues. In 1911, the percentage of vaccinated was 84·3; for 1912 it is only 71·1, a decrease of 13·1 per cent. The Exeter district, as previously, is the best vaccinated district, and Plymouth the worst. These figures confirm the alarm raised by so many medical officers of health as to the danger of the conscience-objection clauses of the Vaccination Acts in providing so much inflammable material in the case of smallpox outbreaks."

Borough of Workington

Dr. C. S. Thomson, M.O.H., writes: "I have no returns on vaccination, but I fear that a large number of people in this town are un-vaccinated or only partly protected. Strange how we forget our lessons—the public memory is very short. There is but one creed and no other, and that is—vaccinate in infancy and again in adolescence. All your conscience clauses and freedom to form an opinion of your own in this matter are just so many dangers."

Bridlington

Dr. Wetwan, M.O.H., referring to the decline in vaccination in his district, writes: "Anything much more deplorable from a sanitary and common-sense point of view than is indicated in these figures . . . would be difficult to conceive. It is a sad reflection on the 'conscientiousness' of all concerned—parents, magistrates, legislators, and administrators. For parents there is this to be said, they are mostly ignorant of the perils awaiting an unprotected community, and they have not now the daily, almost hourly, reminders of the devastating effects of smallpox which so constantly oppressed their forefathers. Their inclination to avoid a fractional amount of trouble causes them to lend a ready ear to the mischievous lies of irresponsible and self-seeking faddists, who will be conspicuous by their absence when the ghastly results of such folly are seen in the faces of the survivors, and commemorated in the registers of the smallpox hospital and the cemetery. In those 205 cases of 'exemption,' it seems impossible that the officiating magistrate can have conformed to the terms of the Vaccination Acts—for not one in twenty of the people to whom I speak on the subject can give me the one legitimate reason for making the declaration. I have in a few instances been told that it is not now necessary, and that 'sanitation' has killed the disease—unfortunately this is not the fact—the disease now is sometimes more virulent and fatal than it was a hundred years ago."

Swansea Rural District

Dr. E. Rice Morgan, M.O.H., writes: "The proportion of so-called 'conscientious objectors' to vaccination is steadily increasing, and unless an epidemic of smallpox comes to shake the public out of their self-complacent state, vaccination will soon fall into almost entire disuse."

BRISTOL

Dr. D. S. Davies, M.O.H., has pointed out that during 1911, the last year for which full figures are available, the percentage of successful vaccinations to births was only 37·78. He adds: "The continuous and marked decline in vaccination of late years will result, but nobody can say when, in sad awakening for many a misguided parent, and in hospital accommodation difficulties for unready authorities. It would not serve any useful purpose to state fully my views on the folly of this neglect, for, as Chesterton, I think, has said, 'The masses will only accept as true, statements made without authority.' And anti-vaccination is a 'cult,' not a state of mental conviction."

HAMPSHIRE

In his annual report, Dr. R. A. Lyster, County medical officer, Hampshire, writes: "There appears to be a continuous increase in the neglect of vaccination, not only in this county, but all over the country, and this will probably go on until an outbreak of smallpox brings ignorant people to their senses in this matter."

NEWPORT (MON.).

Dr. J. Howard-Jones, M.O.H., writes:—"The vaccination returns for the year 1911–12 were again most unsatisfactory. Every unvaccinated person, whether infant or adult, is a source of danger to the community.

. . . . .

"Yet once more I utter my protest against the policy adopted in this country of increasing the facilities for escaping the duty of vaccination.

. . . . .

"The Government should either undertake the cost of smallpox outbreaks, as they do with swine fever, or give back to local authorities the protection afforded by a well-vaccinated community."

A WARNING FROM INDIA. "WAKE UP, ENGLAND"

By H. G. WATERS, M.R.C.S., L.R.C.P., Medical Officer E.I. Ry., Jamalpur, India

"It is about time that England should waken up to the fact that increasing neglect of vaccination is rapidly reproducing the unprotected condition which prevailed in pre-vaccination days when about 20 per cent. of all deaths were due to smallpox. At least

99 per cent. of medical men ascribe the decrease in the deaths from smallpox to the protective effect of vaccination. It is alarming to note that the number of exemptions are steadily increasing in number, having advanced from 6·3 per cent. of the births in 1907 to 31·6 per cent. of the births in 1912. I blame the authorities in England for not putting before the populace a clear statement, first of the ravages of smallpox before vaccination, second of the vast diminution of smallpox among children, undoubtedly the result of primary vaccination, third of the necessity of re-vaccination. The cost of vaccination and re-vaccination is fractional compared with the expense of keeping up isolation hospitals and the enormous cost and loss caused directly and indirectly by an outbreak of smallpox.

. . . . .

"The public health authorities will have to face the consequences and direct expense of providing for the public safety when the inevitable outbreak occurs, and the indirect loss to the community at large will of course fall on the nation.

"It seems to me to be an anomaly that this essentially public health work should be administered by the Poor Law Guardians.

"After the outbreak, which sooner or later must come, pro-vaccinists will have nothing more to worry about; the necessity for vaccination will once more have proved itself, and the survivors will force the Government to enact suitable laws for the provision and enforcement of vaccination.

"This duty should devolve upon the public health service. The medical officers of health know and realise the danger, they should be made responsible for seeing that the provisions of Vaccination Acts are carried out. More particularly in my opinion this body of 'State' health officers should see to it that the ignorance of the populace generally and the misleading statements of the opponents of vaccination should be combated by suitable literature and popular lectures. School teachers should be taught the meaning and importance of the charts and figures available so as to enable them to spread the knowledge, by means of the schools, throughout the length and breadth of the country, of the danger now facing the nation.

"Too much reliance is now placed on the removal of foci of infection to isolation hospitals, with the immediate vaccination of contacts. This may serve to protect the nation for a time during the prevalence of sporadic cases or limited outbreaks. When the general epidemic comes along, all this procedure must inevitably break down, and this will be the picture: Hospitals overcrowded, cases left in houses spreading infection, anti-vaccinators and the present apathetic population panic-stricken and clamouring for vaccination, and not enough lymph to go round."[1]

[1] But see footnote on p. 187 (C. K. M.).

APPENDIX V

STATISTICAL PROOF OF THE EFFECT OF VACCINATION IN MODIFYING SMALLPOX

THE following statistics show the extent to which smallpox is modified by vaccination:

BRISTOL

In his report on smallpox in Bristol in 1893–4 the Medical Officer of Health, Dr. Davies, gives a table (p. 14) in which the cases of smallpox, 360 in all, are classified into four groups, Hæmorrhagic, Confluent, Discrete, and "Trivial." The last-named group he defines as "very mild discrete cases, where after the initial fever (which may be severe), and the eruption of a very sparse crop of papules, sometimes not more than one or two, all constitutional symptoms at once and finally disappear, no secondary fever supervenes, and, but for the presence of the few abortive vesicles and pustules, the patient is quite convalescent."

The following figures are derived from Dr. Davies' table:

SMALLPOX IN BRISTOL, 1893–4

(Expressed in percentages)

No. of Marks.	"Trivial."	Discrete.	Confluent.	Hæmorrhagic.
1	23·9	52·2	23·9	0·0
2	30·4	50·0	15·7	3·9
3	27·5	48·7	18·7	5·0
4 or more . . .	41·7	48·3	6·7	3·3
All vaccinated cases .	30·9	49·6	15·9	3·4
Un-vaccinated cases .	7·3	17·0	65·0	9·7

It is evident that the highest proportion of "trivial" cases, (which have been shown elsewhere to be so dangerous to the community), occurs amongst patients with four or more marks, *i.e.* the most efficiently vaccinated.

In Appendix VIII., Final Report, R.C.V. (pp. 205 and 77), Dr. Coupland gives tables showing the type of attack in vaccinated and un-vaccinated persons respectively in Bradford and in Manchester, from which the following figures have been abstracted:

BRADFORD, 1893

	Hæmorrhagic.	Confluent.	Semi-Confluent.	Discrete.	Mild.	All Types.
Vaccinated	7	81	26	247	137	498
Un-vaccinated	3	79	18	23	5	128

The same figures expressed as percentages:

	Hæmorrhagic.	Confluent.	Semi-Confluent.	Discrete.	Mild.	All Types.
Vaccinated	1·4	16·2	5·2	49·59	27·5	100
Un-vaccinated	2·3	61·7	14·06	17·1	3·9	100

Influence of Marks

No. of Marks.	Percentage of Mild Attacks.
1	22·5
2	20·6
3	34·3
4	45·4
Un-vaccinated	3·9

MANCHESTER, 1892–3

(Percentages)

	Mild.	Discrete.	Semi-Confluent.	Confluent.	Hæmorrhagic.
Vaccinated cases	25·4	54·4	7·4	12·0	0·6
Un-vaccinated cases	0·0	29·4	16·4	47·0	7·0

Total cases: Vaccinated, 641; Un-vaccinated, 85.

Influence of Marks

No. of Marks.	Percentage of Mild Attacks.
1	13·8
2	17·2
3	24·0
4	47·7
Un-vaccinated	0·0

The above figures show that these "trivial" and "mild" cases are from four to seven times as numerous amongst vaccinated persons as amongst the un-vaccinated, and that they are twice as numerous amongst those with four marks (the well-vaccinated) as amongst those with only one mark (the badly vaccinated).

Hitherto it has been regarded as one of the great advantages of infantile vaccination, and especially of " efficient " vaccination, that it tends to produce " trivial " cases. In the light of modern experience it would appear that from the point of view of the community this tendency may in reality be one of the great drawbacks to vaccination.

APPENDIX VI

(1) PARTICULARS OF OUTBREAKS OF SMALLPOX OCCURRING IN LEICESTER IN 1902

The following particulars as to smallpox outbreaks in Leicester in 1902 are taken verbatim from the author's Annual Report for that year, pp. 21-25. There were altogether eighteen cases reported, five of which proved fatal. They are given in order to show that Leicester has not always had to deal with a mild type of the disease.

Smallpox

The epidemic of this disease in London, which began towards the close of 1901, attained serious dimensions during the early months of 1902, and was not finally subdued until about September. As was only to be expected, the presence of the disease in epidemic form in the Metropolis caused it to be widely disseminated. Localised outbreaks of the disease occurred in most large towns, and Leicester was no exception.

1. The first importation into the borough occurred early in February, in the person of a workman (J. C.) from Horsham, who was employed in boiler-covering at the new West Humberstone Destructor. He began to feel ill a day or two after his arrival in Leicester, and three days later the eruption appeared. Unfortunately, although he consulted a medical man, the nature of his illness was not recognised, and he was allowed to continue at work.

Two days later the man had become so ill, and the eruption was so noticeable, that his fellow workmen became suspicious and sent word to the Sanitary Office. He was at once visited by the Medical Officer of Health, who found him to be suffering from the confluent form of the disease, and he was removed to hospital forthwith.

Owing to the delay which took place before the nature of the disease was discovered, during which time the man continued at work and was going about the town visiting public-houses, etc., a considerable number of people must have come into contact with him. Fortunately, however, only one person contracted the disease. This was a young man (G. A.) who frequented a public-house visited by J. C. G. A. had a very severe attack, but eventually recovered. When G. A. was first taken ill, he was nursed by his mother, Mrs. A., aged 66, for two or three days before a doctor was called in and the nature of the case diagnosed. He was then at once removed to hospital. I made great efforts to induce Mrs. A. to consent to be revaccinated. The risk she ran of contracting the disease was clearly pointed out to her, and she was advised that immediate vaccination was the only thing likely to prevent the disease from developing if it had already been contracted. My experience of smallpox satisfies me that had she at once submitted to vaccination she would almost certainly have escaped—if not entirely, at least with a modified attack. Unfortunately, my efforts were in vain. Mrs. A. replied that she had already been vaccinated once—in infancy—and that that ought to suffice ; also, that she was " not afraid."

I explained to her that vaccination in infancy (66 years before) could not be expected to protect after so long an interval of time, and that the mere absence of fear gave no protection. But Mrs. A. was quite immovable. She was a very worthy and estimable old lady, quite fearless, with a strong religious sense, and a firm fatalist. Moreover, she had an abhorrence of vaccination as of something immoral. Her final reply to me was : " I have trusted in God for 60 years, and I shall trust in Him still."

I regret to say that she developed the disease a fortnight after her son was removed ; the attack, unfortunately, proved to be of the dreaded hæmorrhagic type, and proved fatal in a few days.

2. The second importation occurred in March ; a man (R. W.), a tailor by trade, who had tramped from London and taken lodgings in Leicester, was taken ill with smallpox the day following his arrival. Three days later the eruption appeared, and he went to the Infirmary as an out-patient, sitting in the Casualty Department amongst a number of other patients. Unfortunately, the nature of the disease was not recognised, and he was sent away with a bottle of medicine. The same afternoon he visited one of the most frequented drinking-bars in the town. The following day (Sunday) he stayed indoors all day, but on Monday he again went out and visited another public-house. The eruption was now so far developed, and the man so ill, that the publican's suspicions were aroused, and he sent word to the Sanitary Office. In the meantime, however, the occupier of the house where the man was lodging had also become suspicious, and called in a doctor who at once reported the case, which was then removed to hospital. It proved to be a very severe case of the hæmorrhagic type, and proved fatal three days after admission.

From the unfortunate circumstances of this case—the severity of the attack and the large number of persons who must have been in contact with the patient—it was naturally expected that other cases would spring from it. Happily these fears were not realised, as not a single further case resulted. One of the contacts, a woman, developed suspicious symptoms at the end of a fortnight, and was removed to an isolation ward at the hospital for observation, but the attack proved not to be smallpox, and she was allowed to return home after a few days.[1]

3. The third outbreak also occurred in March, a few weeks after the above, in the person of a tramp (J. D.) from London. About 9.30 a.m. on a Monday morning, a gentleman (Ald. T. Smith) observed a man walking in Granby Street with an eruption upon him. Rightly suspecting the nature of the disease, he at once sent notice to the Sanitary Department, and the man was promptly overtaken and brought to the courtyard of the Town Hall. He was there seen by the Medical Officer of Health, the ambulance telephoned for, and the case removed to hospital. It appeared that the man had left the Lutterworth Workhouse two nights before, had slept under a haystack the following night, and had walked on to Leicester early in the morning on the day on which he was so fortunately discovered. He stated that the eruption had then been out on him for three days. The man made a good recovery, and no further cases resulted.

A few days after the occurrence of the last case, one of the maids (A. H.) at the Fever Hospital on the Groby Road developed the disease. How she contracted the infection is not quite certain, but it was thought that the porter who carried the stores from the Groby Road Hospital to the Smallpox Hospital ($\frac{1}{4}$ mile distant) might in some way have conveyed it. She herself had not visited the Smallpox Hospital. She had been vaccinated in infancy, but never re-vaccinated. She had a very mild attack.

4. The fourth outbreak occurred in April. Within four days three cases (B. N., F. P., and F. G.) were notified and removed to hospital. The first case was a child, the other two were young women both employed at public-houses. On investigation it was discovered that a workman (D. J.) coming from Bootle, engaged on temporary work in Leicester, had taken lodgings for a few days at the house of B. N. a fortnight before the latter was taken ill. During his stay in the house he had complained of feeling unwell, and one day (a Sunday) he had stayed in bed. A few spots were noticed on his face, but were not thought to be anything serious, and he consulted no doctor. He continued at his work till the job was completed, and then went to his home at Leeds. He was in Leicester about five days. He recollected having visited one of the

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[1] This course, viz., removing suspicious cases from their homes for isolation and observation, has since been not infrequently followed where the circumstances rendered it desirable.

public-houses in question, and there can be little doubt that he visited the other also.

A fortnight after his return to Leeds several members of his own family were attacked with smallpox. The etiology of this outbreak is therefore quite clear. The workman (D. J.), who had been vaccinated in infancy but not re-vaccinated, suffered from a mild abortive attack of smallpox, the illness being so slight that its real nature was never suspected at the time. The outbreak in Leicester went no further, but it illustrates the danger of smallpox being spread by mild unrecognised cases.

5. The next case which occurred was in May, three weeks after the last of the previous cases. This was a man (J. H. N.). How he caught the disease was never ascertained, but from the circumstances it seemed impossible that he could have contracted it from any of the previous cases. No spread occurred.

6. The next case occurred eleven days after the above. This was an engine-driver from Wellingborough (T. D.), who came to Leicester on a visit and was taken ill with smallpox a few days later. The infection was clearly contracted in Wellingborough. The case was at once reported and removed to hospital. It was of the hæmorrhagic type, and proved fatal two days after admission. No spread occurred.

7. The seventh outbreak began in July, in a man (T. L.). The source of infection was never traced. Living in the house with him were his wife, vaccinated and re-vaccinated, and an only daughter (M. L.), age 15, un-vaccinated. I endeavoured to persuade the parents to have this girl vaccinated as soon as the nature of the father's illness was recognised. My experience of smallpox satisfies me that had the girl been vaccinated *at once*, the vaccination would in all probability have been in time to have saved her from taking the disease, or at least would have mitigated the severity of the attack. Unfortunately, my advice was not taken ; the girl was not vaccinated, and she began to sicken with the disease eleven days after the father was removed to hospital. Both father and daughter had very severe attacks ; the former recovered, but the daughter died.

Four weeks after T. L. was removed to hospital two cases of the disease occurred almost simultaneously in Humberstone Gate. These were H. H. and M. H., also father and daughter. Upon investigation it was found that Mrs. H., the wife and mother, had been unwell a fortnight previously. She had felt out of sorts, and had been a little feverish for a day or two, and then a few pimples had appeared on her face. The illness only lasted a few days. There is no doubt that she had a slight unrecognised attack of smallpox, and further investigation enabled us to connect her case with that of T. L. two weeks before. This case was a further illustration of the danger accruing from mild, unrecognised cases. Both Mr. and Mrs. H. had been vaccinated in infancy. Their daughter had never been vaccinated; she had a severe confluent attack, which proved fatal.

Unfortunately the illness of M. H. was at first mistaken for measles, and, under the belief that it was only that disease, her parents allowed a playmate (A. J.) to visit the house to view the Coronation Procession. A. J. developed the disease a fortnight later, and there the outbreak terminated.

8. No further cases occurred in the borough until the end of the year, when the disease was introduced into the Workhouse by a tramp (G. S.). This case was the beginning of an outbreak at that institution in which some twenty-two cases occurred, but only two of them (G. S., and one other, J. G.) occurred in 1902. (This outbreak has been dealt with in Chapter V.)

The total number of cases, therefore, occurring during the year was 18, exclusive of the two unrecognised cases which were not reported, and the existence of which was only discovered after the persons had recovered. Several of the cases were of a very severe type, and five proved fatal.

(2) STATISTICS OF SMALLPOX IN LEICESTER, 1903–4

From Special Reports on Smallpox in Leicester

By C. K. Millard, M.D., M.O.H.

CLASSIFICATION OF CASES AND DEATHS

1903 EPIDEMIC

December 1902—October 1903

	Cases.	Deaths.	Fatality per cent.
Vaccinated	127	1	..
Un-vaccinated . . .	192	3	..
Uncertain	2	..	..
Total . . .	321	4	1·24

1904 EPIDEMIC

December 1903—August 1904

	Cases.	Deaths.	Fatality per cent.
Vaccinated	194	4	2·06
Un-vaccinated . . .	198	16	8·08
Uncertain	2	1	..
TOTAL . . .	394	21	5·33

THE TWO EPIDEMICS COMBINED

December 1902—August 1904

	Cases.	Deaths.	Fatality per cent.
Vaccinated	321	5	1·55
Un-vaccinated . . .	390	19	4·87
Uncertain	4	1	..
TOTAL . . .	715	25	3·49

THE VACCINATION OF CONTACTS

1903 EPIDEMIC

The number of invaded houses (excluding Workhouse, Lodging Houses, and a few houses which could not be classified) was 251.

The number of inmates of these houses (exclusive of the person first attacked) was 1,167.

Of these, 104 persons, or 8·9 per cent., were subsequently attacked.

A distinction, however, must be made between those houses where the first case was recognised (and the patient removed to hospital) and those where it was not recognised.[1]

TABLE I

	No. of Houses.	No. of Inmates.	No. who contracted Smallpox.	Attack-rate per cent.
First case recognised . .	233	1,084	54	5·0
First case not recognised .	18	83	50	60·2
TOTAL . . .	251	1,167	104	8·9

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[1] Cases were classified as " not recognised " if they were not recognised until after the eruption had been out for more than a week.

These figures show the terrible risk which is incurred by the other members of a household where the first case of smallpox is not recognised.

Amongst the 1,084 inmates in the 233 houses where the first case was recognised, 794 of the inmates, or 73·3 per cent., submitted to vaccination when the nature of the first case became known, and of these 18, or 2·3 per cent., afterwards developed smallpox; of the 290 who did not get vaccinated, 36, or 12·4 per cent., were attacked, as shown in the following Table.

TABLE II

	No. of Persons.	No. who contracted Smallpox.	Attack-rate per cent.
(1) Inmates who got vaccinated after occurrence of first case . .	794	18	2·3
(2) Inmates who did not get vaccinated after occurrence of first case .	290	36	12·4
TOTAL	1,084	54	5·0

In order, however, to be able to make a fair comparison between those who got vaccinated and those who did not do so, it is necessary to make certain important allowances.

Thus, amongst those who did *not* get vaccinated were all those persons, 51 in number, who had already had smallpox, together with ten who had been so recently vaccinated that a further vaccination was not considered necessary. These cases must be excluded.

We must also exclude a house containing seven persons who did not get vaccinated [1] and all of whom developed smallpox. In this case there was so much delay in reporting the first case that vaccination was scarcely advised. For our present purpose, indeed, this house should be regarded as one in which the first case was "not recognised," although it does not quite fall within our definition of such cases.

Then, in the group of those who did get vaccinated there was a woman whose vaccination did not "take," [2] but who took smallpox. This case might reasonably have been included amongst those who did not get vaccinated, but I have thought it best to exclude it altogether.

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[1] Two of these cases were afterwards vaccinated a few hours before removal to hospital.

[2] Due possibly to lymph being used which had been kept in stock too long. The operation was performed by a private practitioner. Other persons in the same house, vaccinated at the same time by the same doctor, only "took" very slightly.

After making these corrections I believe that the two groups may be fairly compared. We then have :

TABLE III

(*Table II. corrected*)

	No. of Persons.	No. who contracted Smallpox.	Attack-rate per cent.
(1) Inmates who got vaccinated after the occurrence of the first case .	793	17	2·1
(2) Inmates who did not get vaccinated after the occurrence of the first case	222	29	13·0
TOTAL	1,015	46	4·5

Thus, the figures are not materially altered. They prove that vaccination after exposure to infection is of *very great value.* If those inmates of invaded houses who got vaccinated after exposure had not been so vaccinated, and if the same attack-rate had prevailed as prevailed amongst the 222 who did not get vaccinated (and I believe that it would have done), the number of secondary cases would have been 103 instead of only 17.

To put it in another way. Six times as many inmates contracted smallpox amongst those who did not get vaccinated after exposure as amongst those who did.

Such a result, surely, amply justifies our attempts to persuade persons living in invaded houses to get vaccinated. At the same time, I do not think that we are warranted in claiming that it was this vaccination which brought the epidemic to a close. It contributed to that event, but it certainly was not the principal factor. The extra cases which would have occurred had there been no vaccination of contacts, *would all have been in houses under surveillance,* and on the first symptoms of illness they would have been isolated. It is therefore very unlikely that many further cases would have arisen from them. I think it right to point this out because the suggestion has been put forward that it was only by the great efforts which were made to get contacts vaccinated that the epidemic was got under control.

VACCINAL CONDITION OF INMATES PRIOR TO EXPOSURE

It is of some interest to consider the vaccinal condition of the inmates of the invaded houses prior to exposure to infection.

Taking the above groups in Table II., and classifying them without correction, we have as follows :

TABLE IV

(1) *Inmates who got vaccinated after occurrence of first case.*

Vaccinal Condition *prior* to Exposure.	No. of Inmates.	No. who took Smallpox.	Attack-rate per cent.
Vaccinated	388	5	1·0
Un-vaccinated	399	13	3·2
Uncertain	7	..	..
TOTAL	794	18	2·3

(2) *Inmates who did not get vaccinated after occurrence of first case*

Vaccinal Condition *prior* to Exposure.	No. of Inmates.	No. who took Smallpox.	Attack-rate per cent.
Vaccinated	137	15	10·9
Un-vaccinated	96	21	21·9
Uncertain	6	..	..
Already had Smallpox	51	..	..
TOTAL	290	36	12·4

From these figures we see that those already vaccinated at the time of exposure have a decided advantage over the un-vaccinated, whether they subsequently get vaccinated or not. Moreover, almost all the inmates returned as "vaccinated" had been vaccinated 20 or more years before. If a large proportion of the vaccinated had been children, and therefore vaccinated more recently, the difference between the attack-rates would, I have no doubt, have been still more striking.

It will be noticed that there is some difference in the relative proportion of the vaccinated and un-vaccinated in the two groups, there being a larger proportion of vaccinated persons in group (*b*). The explanation is that more difficulty was experienced in getting persons who had already been vaccinated to submit to vaccination after exposure.

In the above comparison (in Table II.) all persons living in the invaded houses who were vaccinated after exposure to infection, and who subsequently developed smallpox (with the exception of the one case in which the vaccination did not take), have been included. But the value of vaccination after exposure all depends *upon the time which elapses after the infection has been received into the system before vaccination is performed.* The above comparison does not take this into account. It is claimed that vaccination if performed not later than the *third day* after infection, will almost invariably prevent the disease from developing (see Table VII. *infra*). Now amongst the 17 persons who developed the disease after vaccination, there were six in whom the interval between vaccination and the onset of smallpox was less than nine days (viz., 8, 7, 6, 5, 3 and 2). As the duration of the incubation period is usually taken as averaging 12 to 14 days, we are justified in regarding these six cases as having all been vaccinated *more* than three days after the date of infection. In most of the cases it must have been much more. These six cases therefore were clearly vaccinated *too late*.

THE IMPORTANCE OF PROMPT NOTIFICATION

In order to illustrate the great importance to the inmates of an invaded house of prompt notification and removal to hospital of the first case, I have compiled the following figures. For the sake of simplicity only those houses have been taken in which *none* of the inmates got vaccinated after the first case was removed, so that the only differentiating factor was the length of time the first case remained at home before removal.

TABLE V

Invaded houses in which none of the inmates got vaccinated after first case was removed (including houses where first case was "unrecognised")

Vaccinal Condition *prior* to Exposure.	No. of Inmates.	No. who caught Smallpox.	Attack-rate per cent.
Vaccinated	86	24	27·9
Un-vaccinated . . .	117	51	43·6
Already had Smallpox . .	7	..	..
TOTAL . . .	210	75	35·7

Number of Houses, 45.

Separating the inmates into three classes according as the first case was removed, (1) not later than the third day of eruption, (2) between the third and sixth day, and (3) later than the sixth day or not at all (*i.e.*, "unrecognised" cases), we obtain the following:

TABLE VI

(1) *First case removed not later than the third day of eruption*

Vaccinal Condition *prior* to Exposure.	No. of Inmates.	No. who caught Smallpox.	Attack-rate per cent.
Vaccinated	36	2	5·5
Un-vaccinated . . .	59	9	15·3
Had Smallpox . . .	7	..	..
TOTAL . . .	101	11	10·9

Number of Invaded Houses, 23.

(2) *First case removed between third and sixth day of eruption*

Vaccinal Condition *prior* to Exposure.	No. of Inmates.	No. who caught Smallpox.	Attack-rate per cent.
Vaccinated	16	5	31·2
Un-vaccinated . . .	24	15	62·5
Had Smallpox . . .	..	..	..
TOTAL . . .	40	20	50·0

Number of Invaded Houses, 6.

(3) *First case removed later than the sixth day or not at all*

Vaccinal Condition *prior* to Exposure.	No. of Inmates.	No. who caught Smallpox.	Attack-rate per cent.
Vaccinated	34	17	50·0
Un-vaccinated . . .	34	27	79·4
Had Smallpox . . .	1	..	..
TOTAL . . .	69	44	63·8

Number of Invaded Houses, 16.

From this it appears (apart altogether from the question of vaccination) that where the first case is removed to hospital within three days of the appearance of the eruption (as it should be in all cases where a medical man is in attendance) the risk of the other inmates contracting the disease is only about a *fourth* of the risk where the first case is allowed to remain in the house from four to six days, and only a *sixth* of the risk where the first case is only removed after a still longer interval.

But the advantage of early notification is even more striking in the case of those who got vaccinated after the nature of the first case was known, the reason being that vaccination performed after infection can only be relied upon to protect if performed promptly.

TABLE VII

Inmates of Invaded Houses who got vaccinated[1] *after exposure to infection*

Day of Eruption (of first case) on which other Inmates were vaccinated.	First Day.	Second Day.	Third Day.	Fourth Day or later.
Number of Inmates . . .	210	359	102	116
Number who developed Smallpox .	None	2	5	10
Percentage who developed Smallpox	0·0	0·5	4·9	8·6

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[1] Vaccination was usually performed on the same day as the first case was notified. Six inmates have been omitted, dates being uncertain.

In considering the above figures it should be remembered that smallpox is, occasionally, infectious *before* the eruption appears, so that persons in close contact may be infected earlier than the first day of eruption.

These figures show that inmates of invaded houses who get vaccinated within three days of the appearance of the eruption in the first case can be *almost certain* of escaping the disease. Moreover, this is irrespective of whether they have been previously vaccinated or not.

The practical conclusion to be drawn from this is that where the first case of smallpox in a house is recognised early and the other inmates get vaccinated at once, it is scarcely necessary to stop them from work, as the risk of their developing the disease is so small. Had we acted upon this in the recent epidemic, a considerable proportion of the money paid in compensation might have been saved.

However, owing to the absence of faith in Leicester as to the protective influence of vaccination, we did not usually find it practicable to make a distinction, as regards stopping from work, between those who got vaccinated and those who did not do so.

RE-VACCINATION

A reliable clue to the proportion of re-vaccinated persons in the population of Leicester in those districts invaded by smallpox is obtained from the proportion of re-vaccinated persons found to exist amongst the other inmates of invaded houses. The vaccinal condition of the other inmates was in all cases recorded with special care. Taking the two epidemics together, I found that amongst 1,907 inmates of invaded houses (excluding the persons first attacked) 93 had been re-vaccinated at some time or other in their lives prior to the outbreak of the disease. This is equivalent to 4·9 per cent. Yet out of the 715 cases of smallpox which occurred only 15 had been re-vaccinated, or 2·1 per cent.

VACCINAL CONDITION OF THE POPULATION OF LEICESTER

During the course of the 1903 epidemic I had an investigation made as to the vaccinal condition of the population living in those districts of the town where smallpox had prevailed. From this I found that of 4,946 persons living in 1,056 houses in 22 streets, prior to the epidemic, nearly 62 per cent. had been vaccinated, 35 per cent. were un-vaccinated,[1] and nearly 3 per cent. had had smallpox.

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[1] This was eleven years ago; the proportion of un-vaccinated persons in the population to-day is, of course, considerably greater.

Vaccinal Condition of Population

Houses visited, 1,056.	No. of Inmates.	Proportion of whole.
Vaccinated	3,053	61·7
Un-vaccinated	1,748	35·3
Had Smallpox	145	2·9
TOTAL	4,946	100·0

Perhaps, however, the most reliable clue to the true vaccinal condition of the inhabitants of the invaded districts is the vaccinal condition of the other inmates of the invaded houses.

VACCINAL CONDITION OF INMATES OF INVADED HOUSES

BOTH EPIDEMICS COMBINED—1903 AND 1904

Vaccinal Conditions prior to Outbreak.	No. of Inmates.	Proportion of whole.
Vaccinated	785	41·5
Re-vaccinated	93	4·9
Un-vaccinated	926	48·5
Had Smallpox	78	4·0
Uncertain	25	1·3
TOTAL	1,907	100·0

It is interesting to compare with the above table the vaccinal condition of the persons actually attacked by smallpox, and who were living in the same houses.

VACCINAL CONDITION OF PERSONS ATTACKED

BOTH EPIDEMICS COMBINED—1903 AND 1904

	No. of Cases.	Proportion of whole.
Vaccinated	304	42·5
Re-vaccinated	15	2·1
Un-vaccinated	389	54·4
Had Smallpox	3	·4
Uncertain	4	·5
TOTAL	715	100·0

By a comparison between these two tables we obtain an insight into the relative incidence of the disease upon the vaccinated, the re-vaccinated, and the un-vaccinated respectively. It is important, however, to remember that in Leicester, where vaccination has fallen so largely into disfavour, " vaccinated persons " means, with few exceptions, adults vaccinated in infancy. So also as regards the re-vaccinated class. The great majority of these were persons re-vaccinated very many years ago. Many of them were ex-soldiers, who had been re-vaccinated on entering the army. There are very few recently vaccinated persons in Leicester.

(3) SHOWING BIRTHS, VACCINATIONS, AND SMALLPOX IN LEICESTER, 1838–1913

Year.	Births.	Vaccinations Registd. Public and Pvt.	Small-pox Deaths.	Small-pox Cases.	Year.	Births.	Vaccinations Registd. Public and Pvt.	Exemptions Granted.	Small-pox Deaths.	Small-pox Cases.
1838	1815	Not known	11	Not known	1876	4781	3426	..	..	..
1839	2024	..	50	..	1877	4753	3653	..	6	12
1840	1967	..	56	..	1878	4779	3372	..	1	8
1841	1972	..	31	..	1879	4697	3146	..	..	..
1842	1942	..	..	..	1880	4860	2886	..	..	1
1843	2035	..	..	..	1881	4712	3417	..	2	6
1844	2087	..	9	..	1882	4857	3106	..	5	29
1845	2197	..	164	..	1883	4825	1958	..	3	12
1846	2213	..	12	..	1884	4851	1763	..	..	6
1847	2005	..	1	..	1885	4683	1842	..	..	8
1848	2003	..	31	..	1886	4863	1122	..	..	1
1849	2171	1613	66	..	1887	4695	471	..	..	10
1850	2239	1240	5	..	1888	4814	314	..	..	22
1851	2437	1292	2	..	1889	4796	172	..	..	..
1852	2387	1637	52	..	1890	4699	131	..	..	..
1853	2283	1843	11	..	1891	4790	92	..	..	..
1854	2467	2275	..	..	1892	5816	133	..	6	38
1855	2301	1771	..	..	1893	6006	249	..	15	320
1856	2402	1771	1	..	1894	5995	133	..	..	8
1857	2441	1880	17	..	1895	5962	75	..	..	4
1858	2276	2026	53	..	1896	6212	86	..	..	..
1859	2518	1447	3	..	1897	6252	81	..	..	..
1860	2567	1766	2	..	1898	6152	92	..	..	..
1861	2540	1614	1	..	1899	6273	156	167	..	..
1862	2723	1388	..	..	1900	6207	343	598	..	..
1863	2937	1608	5	..	1901	6169	357	500	..	4
1864	3114	1916	104	..	1902	6313	1237	1500	5	18
1865	3226	1183	10	..	1903	6018	2487	1029	21	406
1866	3412	1641	3	..	1904	5981	1232	1044	4	307
1867	3496	1544	2	..	1905	5888	987	1112	..	5
1868	3588	3379	1	..	1906	5865	1073	1080	..	1
1869	3760	3560	..	..	1907	5534	1093	1256	..	..
1870	3799	3103	..	..	1908	5680	659	2401	..	..
1871	3982	3230	12	..	1909	5431	660	2367	..	..
1872	4162	4456	346	..	1910	5380	564	2335	..	..
1873	4447	3692	2	..	1911	5222	475	2964	..	..
1874	4374	3764	..	..	1912	5182	447	3173	..	..
1875	4270	3527	1	1	1913	5278	436	3391	..	..

APPENDIX VII

FURTHER ILLUSTRATIONS OF THE DANGER OF UNRECOGNISED CASES OF SMALLPOX MODIFIED BY VACCINATION

1. BRISTOL

Bristol appears to have suffered a good deal from the mischief done by mild vaccinated cases of smallpox.[1]

In his Annual Report for 1903, Dr. Davies, the Medical Officer of Health, begins his reference to smallpox by mentioning that although the disease had been introduced into the city on several occasions in the previous year, in no instance did extension result; he then proceeds:

"But the introductions of 1903 were more diversified, the disease arrived from all points of the compass, by sea and land, *and often in remarkably subtle mild forms, so that introduced cases had already formed their initial groups of two-fold, five-fold, or seven-fold spread* before they became notified or known to this department. *As soon as they were recognised, no difficulty was experienced in at once limiting the spread* by carefully applied methods, in which vaccination of contacts played its essential part, while lines of possible infection were followed up through personal communication, laundry, pawnbroker, or any other effective agency, as experience or the circumstances of the case dictated. In the result 9 out of the 15 introduced cases were absolutely limited to one case, whereas some of the others enjoyed a brief period of expansion." (Italics added).

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[1] In a letter to medical practitioners in Bristol, which Dr. Davies had issued in 1891, in consequence of a mild unrecognised case of smallpox occurring in a vaccinated girl of fifteen who continued to go and work at her trade as a tailoress, he had written as follows (italics added):

"Dear Sir,

"Some cases of smallpox may possibly be expected to arise in the course of the next month, and I shall feel very much obliged if you will kindly let me know of any suspicious cases of fever occurring in your practice, accompanied by headache or lumbar pains, and followed in two or three days by any pimples, however few, on the face or body.

"I shall be pleased to visit any such cases with you, *that we may discuss the probability of their being vaccination-modified smallpox; as, unless one is on guard, such cases may, in a busy practice, be easily overlooked.*

"Yours faithfully,
"M. O. H."

Dr. Davies gives a number of instances in support of his statement; but only one or two of these can be quoted here.

(1) Five cases of smallpox were reported simultaneously from a house in Bristol, and on inquiry it appeared that a fortnight previously a workman had stayed in this house when passing through Bristol in search of work. His attack was so trivial that no notice was taken of it, and as a result five persons in the house contracted the disease. Arising from this group of cases was a further group just four weeks later . . . the first case of the second group was apparently an un-vaccinated boy, who subsequently died of confluent smallpox; but the real cause of this second group was soon found to be a "missed" case in the person of the child's father, a barber, who had suffered from severe "influenza" followed by the eruption of a very few papules on the head and extremities, and who had returned to work a few days later.

Altogether eleven cases resulted from the workman who originated this outbreak, and two of these proved fatal. It may be pointed out here that Dr. Davies, like many other Medical Officers of Health, usually mentions the fact if the person contracting smallpox happens to be un-vaccinated; but if the person happens to have been vaccinated the fact is not usually thought to be worth recording.

Dr. Davies mentions the probability that another group of cases originated from the same source as the cases we have just considered. A man developed a very mild attack (unrecognised) and the result was that five further cases occurred.

(2) In another group of cases the medical attendant was clearly at fault. The first case was in an un-vaccinated boy of four years, and although actually suffering from confluent smallpox he was diagnosed by his medical man as a case of chickenpox. The case was subsequently discovered by the Sanitary Inspector, "whose attention was arrested by the appearance of the case." Unfortunately, it was then too late to protect the remainder of the family by re-vaccination (which of course could have been done if the case had been diagnosed within the first few days), and the result was that seven out of eight members of the family contracted the disease.

Moreover, owing to the first case not having been diagnosed, other members of the family had continued going to work, and one of these had been working at a paper factory, with the result that three fellow employees were infected. In the case of one of the latter, the disease was so mild that the medical attendant, "though a careful and capable man," was not alive to its nature, and had advised "open-air exercise in the park."

Dr. Davies states that the four remaining introductions of smallpox during the year were all recognised early and isolated, and consequently no resulting infection took place.

1904. Dr. Davies commences his report on smallpox in 1904 as follows :

" As in the previous year, smallpox was introduced upon several occasions, and into various parts of the district ; and, being in one or two instances overlooked, commenced to spread pretty freely until it became known to the Health Department ; whereupon, in every instance, the threads of distribution were gathered up, and the further spread of the disease was effectually controlled."

Dr. Davies mentions that cases of smallpox in the incubation stage of the disease had passed through Bristol common lodging-houses, apparently without infecting any one, and he states : " After considerable experience of this disease, I have formed the opinion that very little risk of spreading exists (except from intimate contact) before the appearance of the papular rash."

I think most observers of practical experience of smallpox will quite agree with this statement, and it accounts very largely, no doubt, for the comparative ease with which smallpox can be stamped out,[1] provided only that the disease is promptly recognised.

Referring to other cases, Dr. Davies states : " The cases were as a rule most remarkably modified, a source of very considerable danger, as such cases are very often ' missed,' and so lead to wide extension. Fortunately smallpox is an *absolutely straightforward disease*, and a patient either has it, or has it not—he never merely *carries* it as in diphtheria. . . . Every fresh centre was fortunately known to us in time to take the secondary diffusion period under our care ; under such circumstances, for the past ten years experience has shown that control may be effectual."

1906. Dr. Davies writes :

" This disease, which had been absent from the city since June 1905, reappeared in January 1906. The first case was a very mild one. . . . *Owing to the extreme mildness of the case, its nature was not recognised* until January 28th, when his wife and baby were notified from Bedminster as suffering from smallpox, which led to the detection of his attack. Three other children in the house had already contracted the infection, and sickened later.

" A little girl of 12 was attending school from this house during part of the mother's illness, and carried the disease to the school, apparently by infection through her clothes, as she had not yet sickened.

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[1] In this particular respect—*i.e.* its non-infectivity during the pre-eruptive stage—smallpox shows a marked contrast to measles, which, as is of course well-known, is highly infectious before the rash appears. It is for this reason that measles hitherto has proved so difficult to control.

"Five classmates at the school sickened sequentially. . . .

"The unusual incidence of the disease upon a Public Elementary School, *the first example of spreading infection in a school within my local experience*, arrested attention very soon, and a special investigation was made into the condition as to vaccination of the scholars, with the result that *in one class 75 per cent., or three out of every four, were found to be un-vaccinated.* Two of the girls subsequently infected their mothers, but no further spread from this source occurred."

In referring to another case Dr. Davies says: "In this house smallpox was *introduced into another school, where no spread occurred*, though the child subsequently infected her father."

This comparative immunity of the schools in Bristol, in spite of the large proportion of un-vaccinated scholars, is worthy of note, though it is only in accordance with what has been observed in other towns, such as Leicester and Dewsbury, where the majority of the school children are un-vaccinated. It strongly suggests that smallpox is essentially a disease of adults rather than of children, and that the latter, when they do fall victims, are chiefly infected by adults and not by other children. Hence in schools, consisting, of course, almost entirely of children, smallpox shows but little tendency to spread, provided, of course, that modern precautions as to isolation, etc., are efficiently carried out.

1909. Coming now to the year 1909, Dr. Davies begins his report by referring to the success with which he believes smallpox outbreaks can be controlled by careful attention to modern methods, such as isolation and supervision of contacts.[1]

He then goes on to say: "The difficulty in effective repression of smallpox is conditioned by the circumstances. *Ordinary known introductions, by sea or land, are readily rendered sterile, but the 'missed' case, with its many days' unlimited chances, sets a severe problem.*"[2]

To give all the instances related by Dr. Davies where smallpox has been spread by "missed" cases would be wearisome, so numerous are they; indeed, many of his reports are almost a continuous narrative of this class of case.

It is not suggested that all unrecognised cases are necessarily of the mild modified type which we have hitherto been considering. Medical men sometimes also fail to recognise smallpox of the malignant type, mistaking the disease for "purpura."

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[1] Dr. Davies, nothing if not strictly orthodox, qualifies this statement by adding: "when dealing with a vaccinated community." He has previously told us, however, that some of the schools in Bristol are largely un-vaccinated.

[2] I would make the suggestion that in an un-vaccinated community, these "missed" cases would very rarely if ever occur, and that it is quite possible, therefore, that the problem of preventing smallpox in such a community would be easier than it is at present, where so many of the population are partially protected and very liable to contract the disease in an easily overlooked form.

Fortunately this type of the disease is very rare, but when it does occur it is often highly infectious. There is not usually much excuse, however, for failing to suspect smallpox in these cases.

Dr. Davies gives an example of this kind of case in a man, J. S. R., whose medical attendant diagnosed "purpura" and took no precautions whatever. The man was moved in a private ambulance to a general hospital, where he died, and a post-mortem examination having been duly made the death was certified as from "acute nephritis." No suspicions appear to have been aroused, and the body was sent home for burial to a village near Bristol. The result was that this case directly or indirectly infected twenty-four other cases, two of which proved fatal.

If this class of case were at all common or a really serious source of danger, it would certainly be desirable that "purpura" should be made a notifiable disease. Probably such a step has not hitherto been suggested, so far as I know, just because it is so rare.

In connection with the last-mentioned case it may be mentioned that, amongst the persons infected at the general hospital to which the man was taken, were two nurses who had attended upon the patient, and who had been re-vaccinated the year before. They developed the initial symptoms of smallpox, but had no eruption or secondary fever. Unfortunately, however, one of them appears to have infected an un-vaccinated patient who developed the disease twelve days later, and subsequently died—still another example of the un-vaccinated falling victim to the vaccinated.

In another group of cases, a vaccinated man (I say vaccinated, although this fact is not mentioned) sickened with mild smallpox, but, the nature of his illness not being recognised, he continued at his work, and it was not until his un-vaccinated son, aged nine, died from malignant smallpox, that his case was discovered. He also infected three of his other sons. Another house group, consisting of six cases, was almost identical. In this instance the source of infection was not the father, *but a vaccinated child of only fifteen months*, who had a mild attack of what was supposed to be chicken-pox. The real nature of the disease was only discovered on the occurrence of a confluent hæmorrhagic case in another child, un-vaccinated. The vaccinated child also infected a vaccinated young woman of twenty-two, two other children of five and eleven, and her father, aged fifty-three, who unfortunately died.

The last example I shall quote from the Bristol experience occurred in a vaccinated girl, aged sixteen. Her attack was so extremely modified that Dr. Davies was apparently not quite convinced that it really was smallpox, although the facts certainly are extremely suggestive that it was that disease. This girl, S. C., developed the initial symptoms of smallpox (pain in the back, headache, pyrexia), followed three days later by a rash which was very unlike the ordinary smallpox rash. She was isolated in hospital, but at the end of a week it was decided that it was not smallpox, and she was allowed to return home. Three weeks later her brother and father both sickened with undoubted smallpox, the former having a semi-confluent attack, and the latter a hæmorrhagic attack which proved fatal. The girl, S. C., was then re-vaccinated as a test, but it did not "take." Assuming that she had a highly modified attack of smallpox (Dr. Davies suggests that perhaps she had a "benignant hæmorrhagic" attack, caused by a very virulent type of infection acting upon a highly resistant individual) it illustrates once again (*a*) the extreme difficulty there may be in diagnosing modified smallpox in vaccinated subjects; and (*b*) the danger of these very "mild" cases in vaccinated persons spreading the disease to others in a very virulent form.

(N.B.—The italics in the above quotations from Dr. Davies have been added.)

(2) MANCHESTER

In his Health Report for 1902, Dr. Niven, M.O.H., writes as follows: "As usual a large number of cases were overlooked. . . . Not a few have not been diagnosed by the medical attendant. The only remedy for this is education in the detection of the disease. Demonstrations were given at the hospital to any medical men who cared to see the cases. There needs, however, no great subtlety. The Public Health staff are available for consultation, and any papular eruption on the face and arms, or on the face alone, should be reported as suspicious. Great pains have been taken to make this clear to medical men, and also to the public; but the cases are overlooked as before, though not perhaps quite to the same extent."

"*It is not too much to say that by far the most important factor in the spread of smallpox in Manchester has been the overlooking of cases. . . .*"

In the following year, 1904, the mischief done by overlooked cases was still more obvious. In the beginning of February an extensive outbreak occurred in a common lodging-house in Grosvenor Street, Chorlton-upon-Medlock. This was traced to a man, J. W., vaccinated in infancy, who developed a slight overlooked attack. He remained at the lodging-house, taking no precautions, and consequently he infected eight of the lodgers there. He also infected two other lodgers who had gone to live, the one at another common lodging-house, and the other at a private house. The latter was also an overlooked case, and infected three other persons. In addition the case, J. W., continued at his work, and infected his master and three fellow workmen. He also infected three men from another lodging-house who used to mix with the men at the first lodging-house. He visited his wife—a hard-working woman in Ancoats—and infected her with smallpox, and her niece who lived with her. He also visited his brother, in another part of Ancoats, and infected him. He also infected a publican. Altogether this one individual, J. W., is known to have infected twenty-one persons, affecting three common lodging-houses, one public-house, a workshop, and seven private houses. No doubt, it was an advantage for the man J. W. himself that he had been vaccinated, because he might have had a much more severe attack if he had been un-vaccinated, and he might have been badly marked for life. His responsibility, however, was not finished even yet, for the twenty-one persons whom he infected in their turn infected seventeen others, and further crops added still another sixteen to the series, "making the total for which this man is responsible into the enormous sum of fifty-four cases. He may well have been the source of other cases, but the above number represents the cases known to have originated from him." No doubt, too, the value of vaccination was well illustrated if any of those he chanced to infect happened to be un-vaccinated. Almost certainly they would have far more serious attacks than this vaccinated man, J. W. But does it not look as if the fact that J. W. had been vaccinated was a great disadvantage to the community?

Dr. Niven continues: "Another case which was the source of grave harm was that of J. A. (Case 204). This man, whilst living at Walton House in Harrison Street, Ancoats, developed an attack of smallpox, which was not recognised for over a week. He infected fourteen cases at the lodging-house, and two other men who had lived there but removed elsewhere. Also he infected three other persons in private houses. He infected a publican whose beerhouse he went to, also a customer at the beerhouse. Thus this one overlooked case was the direct cause of twenty-one cases of smallpox, affecting one common lodging-house, one public-house, and five private houses. In addition these twenty-one cases infected eight other cases, two of which were again overlooked and infected six persons. In addition five other cases were traced to the same source with a tolerable degree of certainty. Thus the total number of cases for which this overlooked case is responsible is forty."

Dr. Niven gives a table of thirty overlooked cases which were directly responsible for the infection of 115 persons, and indirectly, through these, for 70 additional cases of smallpox, making a total of 186 cases (over three-sevenths of the total cases during the year), having their origin in cases known to have been overlooked. Dr. Niven adds that it must not be taken for granted that the cases given in the table comprise all the cases which had their origin in these overlooked cases, but only those the source of which could reasonably be attributed to them. He points out that as there were seventy cases in private houses, and ten in common lodging-houses which could not be traced to any source, it is reasonable to suppose that a large proportion of them must have been due to overlooked cases, either those mentioned in his table or others not discovered.

From the point of view we are now considering it is very important to note that of these thirty primary overlooked cases (shown in Column I. in Dr. N.'s table) *all except one were in vaccinated persons*. The one exception is stated to have been vaccinated in infancy but unsuccessfully, and if this is correct, must be regarded as un-vaccinated. This case infected five cases directly, and two others indirectly. It affords some evidence that mild cases when they do occur in un-vaccinated subjects tend to spread a mild form of the disease (in marked contrast to the type of disease so often spread by " mild " cases occurring in vaccinated subjects). Out of the five persons infected directly, three were also overlooked, and presumably, therefore, also very mild, although two of them were in un-vaccinated subjects. There was one other overlooked un-vaccinated case during the year. This was a child twelve months old, and was the only case in an un-vaccinated subject so mild that medical advice was not sought. In all the other three overlooked cases in unvaccinated subjects, referred to above, medical advice had been obtained, and therefore they ought to have been diagnosed, but unfortunately they were mistaken by the doctors for chickenpox.

Dr. Niven tabulates the chief influences at work in spreading smallpox as follows :

1. Overlooked cases.
2. Common lodging-houses.
3. Tramps.
4. Public-houses.
5. Places of work.

He considers that the overlooking of mild cases was the chief cause of the spread of the disease, not only in common lodging-houses, but also in private houses, and indeed under all the above headings. The attack as a rule was so mild that no medical advice was sought, or, as happened in not a few instances, was not recognised as smallpox by the medical attendant. Dr. Niven goes on to say : " *In fact this matter is of so much importance that it is not too much to say that if there had been no case overlooked there would have been practically no smallpox outbreak in Manchester.*" (Italics have been added.)

(3) SALFORD

The Medical Officer of Health for Salford, Dr. C. H. Tattersall, gives an example of the danger to medical men themselves of being unable to recognise mild cases of smallpox. A man, Mr. M., who had been in contact with a case of smallpox on board ship, was taken ill after his return to Salford with the usual symptoms, and a rash appeared on his forehead. He sent for his medical attendant, but the latter, *although knowing the man had been exposed to infection*, considered the rash was so unlike an ordinary smallpox rash, that he had no hesitation in concluding that it was not a case of smallpox. He paid dearly for this error, for a fortnight later, the doctor himself, as well as the patient's wife and child, were taken ill with smallpox. We are told that this man, M., had been infected on board ship by a man belonging to Staleybridge ; the latter, although seriously ill at the time he landed—so much so that he had to be wheeled to the train—with the rash well marked on his face, was admitted through the Customs Office at Queenborough apparently without suspicion being aroused. Subsequently a deputation from Staleybridge and Salford waited upon the Local Government Board in order to request that " a more careful examination of passengers from foreign countries might be made at the ports, as such carelessness as was shown in this case to have taken place, was a most serious menace to this country."

(4) NEWCASTLE-UPON-TYNE

In a special report on the epidemic of smallpox in Newcastle-on-Tyne in 1903–5, the Medical Officer of Health, Dr. W. E. Armstrong, after referring to the fact that a certain number of children were un-vaccinated, makes the following remarkable statement : " Had not both of these preventive measures (*i.e.* vaccination and re-vaccination) been grossly neglected in Newcastle the disease . . . would have been absolutely unable to put on epidemic form."

I am tempted to observe that as regards re-vaccination I am unaware of any city, town, or village in the British Isles where re-vaccination is not and always has been " grossly neglected," so that Newcastle is not exceptional in that respect. And as regards primary vaccination, I am also unaware of any town where primary vaccination, however sedulously attended to, has proved sufficient to prevent smallpox putting on " epidemic form." Hence it is not very clear exactly what significance Dr. Armstrong wishes attached to his somewhat cryptic statement.

However, he proceeds as follows, and here I can quite comprehend him : " With respect to the more positive means by which the spread of smallpox has been favoured *probably the failure to recognise the disease in its mildest forms is entitled to first place.* A large number of localised outbreaks have been traced back to such mild unsuspected cases, where the person affected had for weeks been going about in a highly infectious state."

Dr. Armstrong omits to state that these "mild unsuspected cases" occur chiefly in vaccinated persons.

Dr. Armstrong does mention, however, that not only mild cases, but occasionally very severe cases escaped recognition. On at least two occasions persons have died from hæmorrhagic smallpox mistaken for other diseases, and only discovered after the spread of infection among the relatives and friends who attended the funerals. This form of attack may, of course, easily occur in un-vaccinated subjects, but it should be observed that a medical man is almost certain to be called in, in such cases, as the patient is very dangerously ill, and the responsibility for not notifying rests with him. Admitting that real difficulty may sometimes be experienced in arriving at a positive diagnosis, a medical man, if he has been properly instructed in the diagnosis of smallpox, should at least have his suspicions aroused and call in the help of the Health Department, when all proper precautions can be taken.

Dr. Armstrong mentions that two undertakers' assistants, neither of whom had been re-vaccinated, were infected with smallpox through handling a smallpox corpse. I may say that in Leicester we do not allow any one who has not been re-vaccinated to handle a smallpox corpse, or indeed to have anything whatever to do with it. Indeed from the time a patient dies until the earth has been filled in the grave no one except our own staff is allowed to come near.

(5) NOTTINGHAM

Dr. Boobbyer, Medical Officer of Health for Nottingham, gives several examples illustrating the danger of these mild vaccinated cases. The following is from his Annual Report for 1902: "Nottingham was happily free from this disease until about the close of the year. The earliest case, that of a gasworks labourer, *æt.* forty, living at Pleasant Row, Hyson Green—a contact with a person from outside, who visited Nottingham while suffering from smallpox—appears to have developed definite symptoms between December 25th and 27th, but these symptoms were not recognised as those of smallpox by the medical man who attended him, and the man was only discovered by me after several persons had become infected through his agency. . . .

"This first case was the means of infecting some sixteen persons, apparently by direct contact. The latter were all adult males, and all had practically simultaneous attacks. All had frequented a public-house at Hyson Green, to which the first patient had also gone while his eruption was still in active development. Most of them recollected, when their own rashes were in progress, that they had seen a similar eruption on the first man's face, neck, and hands. These sixteen secondary cases gave rise, in most instances by easily traceable contact, to about eighteen others. . . . About this time, however, just when we were congratulating ourselves upon having apparently quenched the outbreak, other scattered cases began to appear among residents in the same (Hyson Green) district. The infection, however, in these also, was speedily traced to a barber on the Radford Road, who had pursued his calling while suffering from a mild attack of the disease. This man not only infected about ten of his customers, but also his brother and his brother's family resident in the same neighbourhood, having actually used the bath in the house of the latter while his attack was in progress. His brother was employed in a village outside Nottingham, and going to work while still in an infectious condition, he in turn was the means of conveying the disease to this place. This brings us up to the time of writing in the history of the local outbreak (April 1903). The facts I have recorded afford a fair sample of the circumstances under which the disease has commonly been propagated, and has had to be dealt with."

Eight years previously, in his Annual Report for 1894, Dr. Boobbyer had recorded another outbreak due to an unrecognised case. The particulars were as follows: An outbreak had occurred in the County Asylum in December 1893. Twelve cases occurred all within a period of ten days, with two deaths. A person having access to the Asylum apparently infected a vaccinated woman living in the centre of the old town, close to the Lace Market, *who had an attack of very mild varioloid, the nature of which was not recognised.* This case led to the occurrence of eight others in the same neighbourhood, and to some sixteen others in connection with a lace factory who were infected by means of lace which had been sent out as home-work to the house of the woman above mentioned. Although the outbreak at the Asylum was not traced, it is highly probable that the real cause was an unrecognised case, but in any case the Lace Market outbreak and the factory outbreak might both have been prevented if the first case had been recognised.

Again, in his Report for 1912 (p. 129) Dr. Boobbyer records a further outbreak due to an unrecognised case, though fortunately on this occasion the outbreak was quickly got under control: "The disease was not recognised as smallpox by the medical man in attendance (Case M. 34, vaccinated in infancy), and he was nursed at home, with the result that the other members of the household, consisting of his wife (un-vaccinated), and child (*æt.* fourteen months, un-vaccinated), and a servant (20, vaccinated in infancy) contracted the disease. . . . . The wife and child had sharp attacks of unmodified smallpox, and the maid had a mild abortive attack."

(6) OLDHAM

The Medical Officer of Health for Oldham, Dr. J. P. Wilkinson, reports numerous instances illustrating the spread of smallpox by unrecognised cases. Thus in his report on smallpox in 1903, he refers to a very mild case in a man who continued at his work and visited a public-house for five or six days after the appearance of the rash. During this period he conveyed the disease to at least sixteen or seventeen persons. No statement is made as to this man's vaccinal condition, but there is little doubt that he had been vaccinated, and that this accounted for the mild character of his attack. The Medical Officer of Health also refers to a number of cases occurring in the Hollinwood district, which were associated with one of the mills, "indicating that an unrecognised case had been working there." He states that several cases occurred in a lodging-house, being caused by a mild case which was not detected until the more severe cases caused a search to be made. Again, a little later on, he refers to two houses in which cases had occurred which were unrecognised; in consequence of this every member of the family (six in each house) contracted the disease. Dr. Wilkinson also refers to two other houses in which the first case was not recognised for four or five days, with the result that a large number of the inmates were attacked, though not quite the whole family.

In his Annual Report for 1903 he refers to an outbreak in the Workhouse, which was caused by a tramp who stayed there for two or three days, and who was not recognised as suffering from smallpox. The result was that nine cases occurred in the institution, and two others outside. As a result of these cases, twenty-six additional cases occurred. Altogether, sixty cases were due directly or indirectly to this man, and of these nine ended fatally.

It is reasonable to suggest that if this man had not been vaccinated (as he presumably was, although no statement is made to that effect), he would almost certainly have had a more severe attack with less likelihood of its being overlooked; precautions could then have been taken, the other inmates of the Workhouse could have been vaccinated immediately, and the whole outbreak might have been prevented. No suggestion that vaccination was in any way to blame for this outbreak appears in the report; but the Medical Officer of Health is careful to point out that a probationer nurse in the Workhouse who contracted the disease was the only nurse in the building who had not been re-vaccinated, so that the credit of vaccination was clearly upheld.

The Medical Officer of Health refers to an outbreak in Webster

Street, where a young woman died suddenly after two days' illness. She was not supposed to have been in contact with smallpox, and this disease was not diagnosed, but it appeared later that she had been in contact with an unrecognised case, and that eight persons contracted the disease from this same source. We are not told as to the vaccinal condition of this case, but the young woman unfortunately infected five other members of her own family—four with the confluent form, and one with severe discrete smallpox.

This outbreak illustrates clearly that these very mild unrecognised cases may easily spread the disease in its most severe form, and in my experience, as explained elsewhere, this very rarely happens except with cases occurring in vaccinated subjects, where the "mildness" is only an acquired characteristic, and therefore not transmitted.

In the next paragraph Dr. Wilkinson records that fifteen persons directly contracted the disease from another unrecognised case in Lee Street.

In his report for 1904, Dr. Wilkinson refers to a man who returned to Oldham from Yorkshire, where he had been searching for work, and at the time of his arrival he had some spots on his face and arms; apparently the man consulted no medical man, but he gave smallpox to his four children.

No statement is made as to the man's vaccinal condition, but this class of case practically only occurs in vaccinated subjects; had the man never been vaccinated he would almost certainly have been much more seriously ill, and would have been compelled to call in a doctor, when presumably the nature of the illness would have been recognised, and the spread of the disease prevented.

In his next paragraph Dr. Wilkinson mentions that five cases occurred in another family due to an overlooked case in the house. In August of this same year another outbreak occurred in the Hollinwood district. It appears that a young man, who had been working away from Oldham, had come home eighteen days previously with a "bilious attack" and about two days later he broke out with an eruption; he got better and again left home and his whereabouts was not traced. There is little doubt, however, that the man had been vaccinated in infancy. The usual result followed; a crop of cases of smallpox occurred, including his four brothers and three cases in the adjacent houses; his brother "had infected several of their playmates and relations, and in the course of a week no less than twenty-three cases occurred directly traceable to this family; the medical man attending the four lads, who had not recognised the nature of their illness and who had been treating them for chickenpox, also contracted the disease from them." The Medical Officer of Health thinks that over a hundred cases directly or indirectly contracted the disease from this one source.

Dr. Coupland's Report to the R.C.V. on Smallpox in Oldham and Chadderton, 1892–3

The following is a summary of the un-recognised cases referred to in the report.

Oldham.—The first case known to the authorities was a man, D. B., who developed an attack of smallpox (January 1892) which proved fatal. His wife and child also contracted the disease and the wife's attack also proved fatal. The source of infection was subsequently found to be a vaccinated youth, employed at a public house, frequented by D. B. This youth had only a mild attack, which led to its being overlooked. He appears to have infected two other cases besides those already mentioned. He himself received the infection from his brother, also an unrecognised case, who had been infected whilst attending a football match in Batley. No doubt he there came in contact with some other unrecognised case.

Dr. Coupland gives details of many other groups of cases traceable to unrecognised cases. He mentions one striking instance where several members of one family had all suffered in turn from mild unrecognised attacks of smallpox, during which time, no doubt, they were spreading the disease broadcast, and the nature of their illness was only discovered when at length an un-vaccinated infant a year old developed fatal smallpox.

Dr. Coupland writes: "It is instructive to note how large a number (about sixty) were more or less directly connected with cases the existence of which had been overlooked. Much credit is due to the Sanitary Authority for the manner in which these sources of infection have been revealed, illustrating as it does in a striking manner the vast share taken in the dissemination of smallpox by the milder types of the disease which pass unrecognised."

(7) BOOTLE

"Infection was also spread by means of unrecognised cases, cases in which the attack was so slight that no doctor was called in. A good example of this was the series of cases which occurred in Bianca Street. A case of smallpox having been notified in Sheridan Place, the house was visited by the Inspector, who noticed a woman leaving with spots on her face. An examination of the woman showed her to be suffering from smallpox in the convalescent stage. A visit to her house resulted in the discovery of two other people who had likewise suffered, but were then completely recovered. Altogether some ten cases were traceable to this source, and of course many others might have been infected which are now numbered amongst the untraced cases.

" The measures taken to prevent the spread of the disease consisted in (1) prompt removal of the case to hospital ; (2) thorough disinfection of the house and clothing . . . ; (3) re-vaccination of all contacts ; (4) daily supervision of the infected houses for fifteen days after the removal of the case ; (5) during the height of the epidemic all the common lodging-houses in the town were visited every night and morning . . . ; (6) house-to-house visitation in certain streets. . . .

" It says much for the vigilance exercised when I mention that twenty-six out of a total of 122 cases (or over 20 per cent.) were unearthed by your officials."

And then we have the Medical Officer of Health's confession of the orthodox faith : " The outbreak under consideration has confirmed what has over and over again been proved, viz. that the only preventive against smallpox is vaccination and re-vaccination." (Annual Report, 1903.)

(8) LEEDS

Dr. Coupland mentions a rather striking example illustrating the virulent type of disease frequently spread by " mild " unrecognised cases in vaccinated persons. It appears that a woman, Mrs. F., with two good vaccination marks, had a mild unrecognised attack of smallpox. She infected her husband and two children, all unvaccinated. The husband and one child died, having, the one a hæmorrhagic, and the other a confluent attack. The other child had a semi-confluent attack, but recovered. Mrs. F. herself had been infected by another unrecognised case in a neighbour. (Final Report, R.C.V., Append. VIII.)

(9) GLASGOW, 1892–3

Dr. Coupland's Report to the R.C.V.

" It is obvious that one main cause of an epidemic increasing in extent in spite of the vigilance of the health officers and the prompt resort to isolation, etc., is in the diffusion of the contagion through the medium of cases which have been so trivial in their severity as not to have come under the notice of medical practitioners. . . . Several instances of such ' missed cases ' come to light when inquiry is made into the antecedents of reported cases ; and the house-to-house visitation of the staff of epidemic inspectors in Glasgow has not infrequently been the means of detecting such cases. At the time of my visit steps were being taken to re-vaccinate the mill-hands in a large factory, because of a girl, who with her sisters was working there, having gone back to her work after the holidays with the maculæ of a recent attack of smallpox upon her.

The case came incidentally to the notice of the Medical Officer of Health, in conversation with a medical man who mentioned that he had a doubtful case a fortnight before ; and inquiry at the house elicited the foregoing facts. Another and even more striking instance is the following : During the holiday season, a girl taken by her friends for a ride on an engine, was thrown off it in a collision, and sustained a compound fracture of the leg. She was carried to a cottage in the vicinity, and placed in a bed which had just been vacated by a person who was then thought to have been suffering from chickenpox. Next day she was removed to the infirmary, and her leg was amputated. The amputation did well, but in twelve days from the date of the injury her temperature rose to 103·4°, she had backache and headache, and other premonitory symptoms of variola. Dr. Thomson saw her and had her removed to the smallpox hospital, when a scanty papular rash came out the same evening. Inquiry proved that the previous occupant of the bed in the cottage had really suffered from smallpox. *It would be easy to multiply instances of this inevitable factor in the spread of epidemic disease ; which is especially prominent in smallpox, owing to the mild and markedly modified characters it frequently exhibits*" (italics added) (Final Report, R.C.V., Append. VIII., p. 14).

It is strange that Dr. Coupland should give no hint that these mild and modified cases, which are the cause of so much trouble and have such a tendency to spread the disease, are the direct outcome of our compulsory system of infantile vaccination, or that this factor is only " inevitable " so long as that system remains in force.

In the epidemic of 1900–2 reported upon by Dr. Chalmers, we have the same story of the mischief done by mild unrecognised cases. On p. 12 of his Report, Dr. Chalmers writes : " As in past outbreaks, we are again finding that one of the greatest obstacles to effectively coping with the disease is the occurrence of an extremely mild and modified form, which escapes recognition until, as a result, secondary cases of a grave nature arise. The history of these milder cases is strikingly uniform, and it may help towards a recognition of this form of the disease to briefly outline it here. In the majority of such cases medical advice is not sought ; indeed, there may be said to be no definite illness—merely indisposition for a day or two, some little derangement of appetite, and then a few spots of the appearance of pimples, on the face, body, or limbs. With the appearance of these spots the symptoms of indisposition pass off, and the patient is confirmed in his impression that the attack is a ' bilious ' one."

(10) SOUTH SHIELDS.

" *Origin of Cases.*—The disease was introduced into the borough on at least six different occasions. It never, however, obtained any hold. Its introduction in the beginning of January appeared to be due to a tramp who had passed a night in the common lodging-house in which the first notified case evidently contracted the infection. After an interval of about a month four more cases were notified, three evidently from a common source of infection, and all four possibly connected with the January case through some person suffering from an unrecognised attack. From one of the cases in this February group (a woman of ill fame, residing in one of the most squalid districts in the borough) there arose certainly eight, and probably nineteen cases which continued to crop up till the end of April."

"During the month of June intimation was received by me that a large quantity of milk, sent into the town from Cumberland, was believed to be infected with smallpox. The facts were that a man with the smallpox rash out on him had been engaged for several days milking cows at one of the farms from which the implicated milk was drawn. By the time the information reached me the milk had all been sold, and it was impossible to trace the consumers. Disinfection and other precautionary measures were carried out at the restaurants affected, and we awaited events with considerable anxiety. However, the infected milk proved absolutely barren of results." (Annual Report, 1903, by Dr. J. J. Boyd, M.O.H.)

(11) CAMBRIDGE

A very remarkable and unusual outbreak of smallpox occurred at Cambridge in 1903, and at the time caused somewhat of a sensation. The circumstances were as follows :

The Medical Officer of Health was consulted (on May 20th) by a medical man on account of a doubtful case of illness, of an anomalous nature, suspected to be either smallpox or chickenpox. As chickenpox had been prevalent in the borough and no case of smallpox was known to exist, the Medical Officer of Health, being in some doubt, decided to engage the services of a consultant. The latter saw the case and came to the conclusion that it was one of chickenpox of an unusual type. Consequently, the case was not isolated in hospital nor the usual precautions taken.

At the end of a fortnight secondary cases, of a similar anomalous character, began to occur ; and they also were diagnosed as chickenpox. It was several weeks before the medical men of Cambridge realised the true nature of the disease with which they were dealing. Indeed, three cases actually proved fatal; but the deaths were nevertheless certified as due to "chickenpox."

It was not until an expert from London (Dr. Wanklyn) had been down and expressed the opinion that the cases were really smallpox that the outbreak was finally accepted as such.

The Medical Officer of Health, in his Special Report on the outbreak, states that between May 20th, when the first case came to his notice, and July 15th no less than 62 cases occurred, all but one of which were afterwards found to be genuine smallpox ; yet only eight of these cases were notified as being that disease ! In the meantime, infection was being scattered broadcast, and it is not surprising that a widespread epidemic occurred before the disease could be stamped out.

Altogether the outbreak resulted in 149 cases, fourteen of which proved fatal. The Medical Officer of Health, in his Report, includes five other cases, with one death, which occurred in subsidiary outbreaks, bringing up the total to 154 cases with 15 deaths.

THE LESSONS OF THE OUTBREAK

We are not informed (in the report referred to) as to the vaccinal condition of the initial cases, the anomalous symptoms of which gave rise to so much difficulty and may be regarded as the cause of the whole outbreak. I think we may safely conclude, however, that they had been vaccinated. Indeed, there were only 16 persons altogether, out of the total of 154 attacked, who had not been vaccinated. I suggest that it is only reasonable to believe—knowing as we do the remarkable effect of vaccination in modifying smallpox—that if these initial cases of smallpox had occurred in unvaccinated subjects it is extremely unlikely that the medical men of Cambridge would have failed to recognise the disease. Proper precautions would then have been taken, and it is probable that the outbreak would have been cut short at the beginning.

It only remains to add that the proportion of fatal cases, as is almost always the case, was very much higher amongst those patients who had never been vaccinated. Amongst the 138 vaccinated cases there were 11 deaths, or 7.9 per cent. ; whilst amongst the 16 un-vaccinated cases there were four deaths, or 25.0 per cent. ; so that the credit of vaccination was once again fully upheld.

INDEX

A

Acland, Dr. T. W., 176
Aërial infection in smallpox, 195
Anderson, Mrs. Garrett, 2, 24, 160
Anti-vaccination League, the, 2
Armstrong, Dr. W. E., 66, 231
Arnott, Dr. Neil, 46
Australia, smallpox in, 103

B

Barry, Dr., 60
Berry, Prof. R. J. A., 103
Biggs, J. T., 109, 110, 114, 117
— *Sanitation v. Vaccination*, 104
Bills of mortality (London), 14
Bond, Dr. F. T., 2, 24, 160
Bonner, J. H., 2, 117
Boobbyer, Dr. P., 69, 232
Bootle, 236
Bradford, 207
Braley, Inspector F., 129, 134
Bristol, 206, 223
Brown, John, case of, 173
Buchanan, Sir George, 34
Byles, Dr., 69, 78

C

Cambridge, 239
Cardiff, 97
Carlisle, M.O.H. for, 67
Chadwick, Edwin, 46, 123
— Lectures, x
Chalmers, Dr. A. K. F., 66
Chickenpox, notification of, 128
Collins, Sir W., 29, 39
Contacts, compensation of, 128
— surveillance of, 21, 126
— vaccination of, 127, 146, 214
Coupland, Dr. S., 94, 102, 160, 236
Coventry, 95
Cowan, Dr. E., 46
Crane, Dr. J. W., 105, 121
Crookshank, Prof. E. M., 11

D

Dalton, Dr. J. H. C., 70
Davies, Dr. D. S., 68, 204, 206, 223
Defoe, Daniel, 65
Dewsbury, 152
Diagnosis, errors in, 189
Dingle, Dr., 54
Disinfection, 21
Drury, Dr. A., 2, 94

E

Eczema after vaccination, 178
England and Wales, smallpox in, 14
Enteric fever, 14, 16
Erysipelas, 169, 179

F

"Fevers," comparison with smallpox, 15

G

Germany, 25, 191
Glasgow, 46, 237
Gloucester, 159
— comparison with Leicester, 163
Gornall, Dr. J. G., 57
Graham, Dr. R., 47

H

Halifax, 91
Hart, Dr. Ernest, 67–101
Haygarth, 32
Herschell, Lord, 25
Hospital accommodation, 49, 188
— isolation in scarlet fever, 49
— — in smallpox, 32

I

Imperial Vaccination League, the, 2
India, smallpox and sanitation in, 50
Infants, comparative immunity of, 150
Injuries caused by vaccination, 167
Inmates of invaded houses, 215
Inoculation and vaccination, 9, 197
Ireland, smallpox in, 19
Isolation, effect of, in smallpox, 49

J

Japan, smallpox in, 52
Jenner, Edward, 15, 32
Jennerian, The, 2, 87, 173, 201

K

Kaye, Dr. J. R., 201
Kirkcaldy, 84
Knibbs, G. H., 52

L

Lancet, The, 114
Leeds, 237
Leicester, and the Royal Commission on Vaccination, 112, 114
— comparison with Gloucester, 163
— demonstration against vaccination, 108
— epidemic of 1872, 121
— — of 1892, 130
— — of 1902, 134, 209
— — of 1903, 134
— — of 1904, 140
"Leicester Experiment," the, 101
Leicester Guardians, 107
— — and L.G.B., 106, 116
— method, the, 115, 125
— smallpox statistics, 213
— unrecognised cases at, 71–77
Levy, Annie, case of, 80
Loat, Miss L., 2
Local Government Board and Dewsbury, 158
— — — and Gloucester, 165
London and smallpox, 19, 35
— bills of mortality, 15
Low, Dr. Spencer, 157
Lymph, ample supply of, 187

M

McCleary, G. F., 66
McIntosh, Dr., 86
McVail, J. C., 16, 101
Manchester, 207, 228
Medical Officers of Health, warnings of, 201
Metropolitan Asylums Board, 33, 35
Middlesbrough, 54
Mile End outbreak, 80
Missed cases of smallpox, 63
Misterton, 169
Modified smallpox, danger of,
Moore, Dr. J., 120

N

Neech ,Dr. J. T., 91
Newcastle-on-Tyne, 231
Newhaven, 87
Niven, Dr. J., 66, 228
Notification of smallpox,
— importance of prompt, 218
Nottingham, 232
Nurses, in smallpox hospitals, 143

O

Oldham, 234
Ossett, school outbreak, 87

P

Pall Mall Gazette, 83
Parkhurst, Dr., 88
Picton, J. A., 29, 113
Plant, Hy., case of, 173
Priestley, Dr. J., 71, 130
Pringle, Surgeon-Major, 111
Punjab, 51

R

Radcliffe, Dr. J. N., 169
Ravensthorpe, 154
Reece, Dr., 187
Re-vaccination, 25, 220
Ricketts, Dr. T. F., 69, 78, 190
Royal Commission on Vaccination, 27, 174
— — — Majority Report, 29
— — — Minority Report, 29, 39, 175

S

Salford, 231
Sanitary Era, 19
Sanitation, importance of, 45
— definition of, 45
Sanitation v. Vaccination, 44
Savill, Dr., 57
School-children, immunity of, 148
Scotland, 19
Sheffield, 60
Shepley, Thos., case of, 91
Simpson, Sir Jas., 40
Snell, Dr. H., 95
Society of M.O.H., the, 6
South Shields, 238
Syphilis, vaccinal, 181

T

Tait, Lawson, 113
Tattersall, Dr. T. H., 231
Taylor, P. A., 106
Thorne, Sir T., 34
Tomkins, Dr., 111

U

Unrecognised cases, danger of, 63, 188

V

Vaccination after exposure, 146
— and sanitation, 61
— effect on individual and on community, 12
— emergency, 186
— infantile, inefficient, 25
— injuries caused by, 167
— *Inquirer, The*, 2, 3
— of nurses, 144
— of population of Leicester, 220
Vaccination, risks of, 22
— tendency to spread smallpox, 63

W

Walford, Dr. E., 97
Wallace, A. R., 15
Walton, Ellis, case of, 92
Wanklyn, Dr. McC., 78, 129, 200
Warrington, 57
Waters, Dr. H. G., 204
Watson, Sir Thos., 39, 182
Wheaton, Dr., 153
Wilkinson, Dr., J.P., 234
Windley, Ald. J., 123

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